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Review of the 1990 - 1991 British Columbia Herring Fishery and Spawn Abundance

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TABLE OF CONTENTS

PAGE

LIST OF TABLES..... iv

LIST OF FIGURES.....v

LIST OF APPENDICES..... vii

ABSTRACT / RESUME..... viii

INTRODUCTION..... 1

METHODS.....1

1990 FOOD AND BAIT FISHERY..... 3

1991 ROE HERRING FISHERY..... 4

Queen Charlotte Islands Sub-district (Areas 2W,2E)..... 6
Prince Rupert Sub-district (Areas 3-5).....9
Central Coast Sub-district (Areas 6-10).....11
Strait of Georgia Sub-district (Areas 11-18).....13
West Coast Vancouver Island Sub-district (Areas 23-27)...17

1991 SPAWN ON KELP FISHERY 20

1991 HERRING SPAWN SUMMARY.....22

Queen Charlotte Islands Sub-district (Areas 2W-2E).....23
Prince Rupert Sub-district (Areas 3-5).....23
Central Coast Sub-district (Areas 6-10).....24
Upper East Coast Sub-district (Areas 11-12).....25
Middle East Coast Sub-district (Areas 13-16).....25
Lower East Coast Sub-district (Areas 17-20).....26
Lower West Coast Sub-district (Areas 22-24).....26
Upper West Coast Sub-district (Areas 25-27).....27
Fraser River Sub-district (Area 29).....27

REFERENCES.....28

ACKNOWLEDGEMENTS.....28

LIST OF TABLES

TABLE		PAGE
1	Distribution of Licences and Gear type by Roe Herring Area, 1991	29
2	Roe Herring Quota (tons) by Roe Herring Area, 1991	29
3	Hailed catches (tons) by Gear and by Roe Herring Area, 1991	29
4	Sales Slip Data (Landed Tons) by Roe Herring Area, 1991	30
5	Hailed Roe Herring Catches (tons) Queen Charlotte Islands by Statistical Area and Gear Type, 1986-1991	30
6	Hailed Roe Herring Catches (tons) Prince Rupert By Statistical Area and gear type, 1986-1991	31
7	Hailed Roe Herring Catches (tons) Central Coast by Statistical Area and Gear Type, 1986-1991	31
8	Hailed Roe Herring Catches (tons) Strait of Georgia by Statistical Area and Gear Type, 1986-1991	32
9	Hailed Roe Herring Catches (tons) West Coast Vancouver Island, by Statistical Area and Gear Type, 1986-1991	32
10	Landed Weight and value of British Columbia Roe Herring Catches, 1980-1991	33
11	Spawn Area Index for Herring spawn deposited in Northern British Columbia by Herring Sub-district and Statistical Area	34
12	Spawn Area Index for Herring Spawn deposited in Southern British Columbia by Herring Sub-district and Statistical Area	35
13	Herring Spawn Summary Tables for 1991 with location, date and size of individual herring spawns	36

LIST OF FIGURES

FIGURE PAGE

1. Statistical Areas in Northern B.C..... 65
2. Statistical Areas in Southern B.C..... 66
3. Herring Sections Queen Charlotte Islands..... 67
4. Herrings Sections Prince Rupert..... 68
5. Herring Sections Central Coast..... 69
6. Herring Sections Johnstone Straits..... 70
7. Herring Sections Strait of Georgia..... 71
8. Herring Sections West Coast Vancouver Island..... 72
9. Rennell Sound, 2W..... 73
   Seine Management Sub-Areas 2-77.
10. Lower Juan Perez Sound, 2E..... 74
    Seine Management Sub-Areas 2-12, 2-13.
11. Lower Juan Perez Sound, Area 2E..... 75
    Gillnet Management Sub-Areas 2-12, 2-13.
12. Chatham Sound, Area 4..... 76
    Gillnet Management Sub-Areas 4-5, 4-7, 4-8, 4-9.
13. Kitkatla Inlet, Area 5..... 77
    Seine Management Sub-Area 5-4.
14. Spiller Channel Area 7..... 78
    Seine Management Sub-Areas 7-13, 7-14.
15. Seaforth Channel, Area 7..... 79
    Gillnet Management Sub-Area 7-3, 7-8, 7-9, 7-12.
16. Thompson Bay, Area 7..... 80
    Gillnet Management Sub-Areas 7-19, 7-21.
17. Upper Baynes Sound, Area 14..... 81
    Seine Management Sub-Area 14-11.
18. Hornby/Denman Island, Area 14 (Single Licences)..... 82
    Gillnet Management Sub-Areas 14-9, 14-11, 14-12
    14-13.

LIST OF FIGURES (con't)

1991 Roe Herring Fishing Locations, Gear-Counts, Hailed Catches and Statistical Areas for British Columbia.

FIGURE PAGE

19. Hornby/Denman Island, Area 14 (Double Licences)..... 83
Gillnet Management Sub-Areas 14-7, 14-8, 14-9, 14-10, 14-11, 14-13.

20. Barkley Sound, Area 23..... 84
Seine Management Sub-Areas 23-9, 23-10.

21. Barkley Sound, Area 23..... 85
Gillnet Management Sub-Areas 23-9, 23-10, 23-11.

22. Nootka Sound, Area 25..... 86
Seine Management Sub-Area 25-6

LIST OF APPENDICES

APPENDIX PAGE

1. Management plans for the 1990 Open Food and Bait fishery. 87
2. Management Plans for the 1991 Roe Herring fishery..... 94
3. Management Plans for the 1991 Spawn-on-Kelp fishery..... 118

ABSTRACT

Chalmers,D.D. 1991. Review of the 1990-1991 British Columbia herring fishery and spawn abundance. Can. Ind. Rep. Fish. Aquat. Sci. No. 213: 128p.

During the 1990-1991 fishing season in British Columbia, herring were harvested for food and bait during November and December 1990, sac roe during March and April 1991 and spawn-on-kelp during March and April 1991.

The total food and bait catch was 968 tons. The total sac-roe catch was 40,288 tons.

There were 38 Spawn-on-Kelp licences issued in 1991 an increase of 10 over 1990. Total production for this fishery was 622,819 lbs.

The 1991 coastwide spawn area index was 34.4 million SAI. and was well below the 52.6 million SAI. recorded in 1990.

Key words: herring, sac-roe, food and bait, spawn on kelp, stock assessment.

Résumé

Durant la saison de pêche 1990-1991 en Colombie-Britannique le hareng a été pêché pour ses divers produis aux époques suivantes : hareng de consommation et pour confection d'appâts en novembre et décembre 1990, rogue en mars et avril 1991 et oeufs pondus sur algues en mars et avril 1991

Les prises totales de hareng de consommation et d'appât se sont élevées à 968 tonnes, et celles pour la rogue à 40,288 tonnes.

En 1991, on a délivré 38 permis puor la récolte d'oeufs pondus sur algues, soit 10 de plus qu'en 1990. La production totale a été de 622,819 lb.

L'indice d'aire de frai ("spawn area index") pour toute la côte a été de 34.4 millions en 1991, ce qui est bien inférieur à celui de 1990 qui était de 52.6 millions

Mots clés: hareng, hareng rogué, consommation et appât, oeufs pondus sur algues, évaluation des stocks.

INTRODUCTION

Pacific Herring (Clupea harengus pallasii) migrate to in-shore areas from offshore feeding grounds in the early fall and winter and then hold in sheltered bays and inlets in preparation for spawning in late winter and early spring.

During this time three major commercial herring fisheries occur; a Food and Bait Fishery, a Sac-Roe Fishery and a Spawn-on-Kelp Fishery.

The Food and Bait fishery takes place in November/December when the herring first move inshore and the fat content is high, while the sac-roe and spawn-on-kelp fisheries occur in March/April during the spawning season when gonad development is near or at maximum.

Once the herring have finished spawning, measurements of individual spawns are made in order to obtain estimates of herring abundance. Since the amount of spawn deposited is directly related to the number spawners, this information when combined with data on catch and age compositions enables Biological Services Branch researchers to make estimates of the overall herring abundance and age class strength. This data is also used to forecast the amount of herring that will return to spawn during the forthcoming year. (Haist and Schweigert. 1990) These forecasts along with biological and management implications are used to establish coast wide fishing areas and quotas for the next year.

METHODS

The major source of information for the Sac-Roe Fishery portion of this publication is extracted from a field Record of Management Strategies (RMS) and for the Food and Bait fishery and Spawn-on-Kelp fishery from in-house memoranda written by Fishery Officers. The RMS reports provide hydroacoustic abundance estimates and roe yield information as well as day to day accounts of management strategies used to manage the roe herring fisheries in each management area.

On the fishing grounds, tonnage estimates of stocks are determined acoustically using echo sounders and are subjective interpretations based on past experience of contracted charter vessel masters, patrol vessel masters and Fisheries field staff.

Spawn data is obtained from annual spawn reports compiled by Fisheries field staff. These reports document the timing and location of individual spawns as well as the length and width of spawn depositions, average layers of eggs on each type of substrate utilized, and percent of vegetation covered by spawn.

SPAWN SURVEY METHODS

During 1991, Fishery Officers used two different methods to collect spawn data:

1. Surface Survey

The traditional method used to estimate spawn deposition has been the standard surface based survey. This type of survey requires field staff to estimate the area of spawn, number of egg layers, and percentage of bare area in each spawn patch by pacing it out at low tide while making visual observations. For sub-tidal spawns a boat is used along with an underwater viewing box, to increase visibility, so that the size and intensity of the spawn can be determined more accuratly. In some cases, observations are made by snorkelling or towing a diver with a snorkel. In locations where the spawn extends to depths below visibility from the surface, a grapple or raking apparatus is used to determine the presence of spawn and collect vegetation samples to estimate the number of egg layers. The dimensions of the spawnings are plotted on large scale marine charts or shoreline vegetation maps made from aerial photographs (eg. Haegel and Hamey, 1979).

The traditional method has been unreliable in areas where spawns are deep and vegetation sparse or spotty. In addition, the effort tends to be inconsistent from both year to year and area to area depending on personnel and vessel availability. The inconsistency is reduced somewhat by having the surveyor report on the techniques employed, the effort expended and information on environmental conditions (eg. tide, water turbidity, weather).

2. Dive Survey

The second method utilizes SCUBA gear to dive and assess the spawn. Two different types of diving surveys have been developed and used in past years. The first one is a comprehensive survey developed by researchers at the Pacific Biological Station over the past decade. (Haegele and Schewigert. 1984). This is a very intensive type of survey and requires a considerable commitment of resource dollars, personnel and time. The method employs a rigid and time consuming sampling system that can provide accurate and consistent estimates of spawn depositions over time.

After several years of comprehensive surveys in selected areas it was clear that the dive survey data was more accurate than that collected from the surface surveys mainly because the width, intensity and patchy areas of spawn deposited sub-tidal could be more accurately assessed.

Because of the high costs of comprehensive surveys, a modified diving survey, or Fishery Officer Dive Survey (FODS), was developed and first used on the West Coast of Vancouver Island and in the

Strait of Georgia in 1987. This type of survey utilizes Fishery Officers trained in SCUBA and either Department of Fisheries Patrol Vessels or chartered vessels as dive platforms. The method is similar to the comprehensive survey but differs in that only a limited number of vegetation/egg samples are taken each day. This not only saves time in surveying but also minimizes the amount of time and costs associated with processing samples.

The FODS survey can best be described as a means of improving the surface data by providing a more accurate assessment of the width, average egg layers, and bare areas within spawns.

Prior to 1987 all spawns were surveyed using the traditional surface methods. Spawn data from these surveys were converted to a standard measurement (standard square meters at medium intensity) so that spawnings could be compared from area to area and year to year (Chalmers 1988). With the development of dive surveys, both surface and dive surveys were conducted simultaneously in several areas and dive information on widths of spawn, percentage vegetation cover, and layers of eggs were used to supplement data collected by the shore based surface surveys.

In 1991 most of the major spawns along the coast were surveyed using the FODS method only. Other spawns, were surveyed using the traditional surface methods.
Although the dive survey estimates of spawn is more accurate there are problems in comparing the results of the two methods.
The most critical of these being the validity of making comparisons of historical estimates of standard square meters from surface surveys and those from dive surveys. In order to minimize confusion resulting from making invalid comparisons of standard square meters by the two types of surveys and yet still provide a method to permit comparisons where appropriate, a new spawn index was developed. This new index, called the Spawn Area Index (SAI) is calculated by multiplying the spawn length by the width, average egg layers and percent bare area. The spawn width is the average measured distance of all transects within the spawn, and percent cover is an average of all the observations in the surveyed area. For both surface and dive surveys, average egg layers are estimated by comparing layers of eggs for each vegetation type by the relative proportions of each vegetation. Tables 11 and 12 provide a time series of spawn data for the years 1986-1991. Areas where dive survey data are used have been asterixed.

1990 FOOD AND BAIT FISHERY

In October 1990, the Management Plans for the open Food and Bait fishery were issued to industry.(Appendix 1). The quota for the fishery was 1,250 tons, with 150 tons allocated to the North Coast

(Area 3-5), 100 tons to the Central Coast (Area 6-10), and 1,000 tons to the South Coast (Area 13, 17, 18).

In the North Coast, the five major fishing companies operating in Prince Rupert were canvassed to see if they wanted any herring from this allocation. Due to the low demand for either food or bait herring there was no interest by companies and therefore there was no fishery.

In the South Coast, twenty 50 ton licenses were allocated to fishermen by means of a lottery draw. Two of the licences were to be fished in Johnston Straits (Area 13) and the remaining 18 were to be fish in the Lower Georgia Straits (Areas 17-18).

In Johnstone Straits, both licenses were used and the total catch was 100 tons. All of the fish came out of Deep Water Bay.

In the Lower Georgia Straits, only fourteen of the eighteen vessels fished and the total catch was 868 tons. The fishing area was opened on a weekly basis from 1200 hours Monday to 1200 hours Friday between November 12 and December 14.

The majority of the fish was caught in Sub-Areas 17-12, 17-13, and 17-16 in Fairwind Channel off Snake Island and in Northumberland Channel where there was a large concentration of fish estimated to be between around 15,000 to 20,000 tons . An additional 318 tons were caught in Sub-Area 17-17 in Pylades Channel.

The large concentration of fish off Snake Island resulted in a number of management problems. The biggest problem was the difficulty the fishing boats had in making small enough sets. In most cases the sets were well in excess of the 50 ton individual allowable quota and meant that vessels either had to take aboard quantities of fish above their quota or wait for other vessels to take some of the fish. This resulted in not only a decrease in fish quality but an increase in time and effort required to manage this fishery. The problem was alleviated when fish began showing up in smaller concentrations in Pylades channel and the fishery was moved to this location.

1991 ROE HERRING FISHERY

In November 1990 Management Plans for the 1991 Roe Herring Fishery were issued to industry (Appendix 2). These plans detail the area licensing system, management plan, catch quotas and the key regulations for this fishery.

In 1991 there were seven separate license areas for both seines and gillnets.

The seine licence areas were: West Coast Queen Charlotte Islands, East Coast Queen Charlotte Islands, Prince Rupert, Central Coast, Strait of Georgia and West Coast Vancouver Island.

The gillnet licence areas were East Coast Queen Charlotte Islands, Prince Rupert, Central Coast, Strait of Georgia and West Coast Vancouver Island.

Each of the licensed areas was assigned a fixed catch quota for seines and gillnets prior to the fishing season and holders of roe herring licences were required to choose one of the areas in which to fish. These fishing quotas are adjusted annually prior to each fishing season depending on the forecast run to each stock assessment area. Management considerations such as catchability of the fish, potential roe quality, and gear allocations between seines and gillnets are also considered when setting area quotas. Once the quotas have been established they are fixed for that year and there are no in-season adjustments.

The pre-season fixed quota system allows fishery managers to set up fisheries on the first available stock of suitably mature fish. This not only provides for a more orderly fishery but in many areas of the coast it is the older, larger fish which spawn first and fishing on these herring can provide higher roe yields and hence increased profitability to industry.

In-season catch estimates, called "hails" are obtained from individual fishermen, who are required to hail their catches prior to leaving the fishing grounds. These figures are generally within 10-15% of the final sales slip data compiled from company landing slips. The hailed figures are used throughout the text because they are used to determine whether or not the quota has been caught, and whether or not the fishery should be closed or remain open. Moreover, final sales slip information is not available until July or August well after the fishery is over.

In summary, the coast wide hailed catch for the 1991 roe herring fishery was 38,881 tons. Of this total 6,965 tons were caught in the Queen Charlotte Islands, 3,630 tons in the Prince Rupert area, 9,215 tons in the Central Coast, 10,864 tons in the Strait of Georgia, and 8,207 tons on the West Coast of Vancouver Island.

The landed value of this fishery was about 66 million dollars, and compares with 78 million dollars in 1990 (41,391 ton catch), 57 million dollars in 1989 (42,016 ton catch), 81 million dollars in 1988 (30,786 ton catch) and, 91 million dollars in 1987 (38,790 ton catch).

Table 1 details the licensing areas and the distribution of gear in each of the areas for 1991. The 1991 coastwide roe herring quota was 32,339 tons, and by regulation was divided between the seine and gillnet sectors on a 55/45% basis (Table 2). The 1991 roe

herring hailed catches are given in Table 3 and preliminary sales slip catches are given in Table 4. Tables 5 through 9 detail the annual roe herring hailed catches by statistical area and gear type for the years 1986 - 1991. Table 10 provides an estimated landed value of the catch based on the average price paid for the seine and gillnet caught fish. The statistical areas and herring sections are shown in Figures 1 - 8 and the 1991 fishing boundaries, fishing times, hailed catches and quotas are shown in Figures 9 -22.

QUEEN CHARLOTTE ISLANDS (AREA 2E, 2W)

AREA 2E

Assessment

Stock assessment was carried out intermittently by the FPV. Arrow Post from February 11 - March 7. Initial soundings located 3,500 tons in upper Juan Perez Sound and 500 tons in lower Juan Perez. There was no assessment made from February 16-22. Stock estimates were up to 5,000-6,000 tons by February 27 and remained at this level until March 11 when it increased to 8,600 tons. During this period there was 2,000 tons in Louscoone Inlet, 1,500 tons in upper Juan Perez Sound and 1,500 tons in lower Juan Perez Sound. The first roe test was made on March 8 in lower Juan Perez Sound and the roe maturity was 0% and with an average fish size of 21.9 cm. By March 16 stocks had increased to 10,800 tons and on March 26 reached a maximum level of 12,000 tons. At this time there was 2,600 tons in upper Juan Perez Sound, 5,000 tons in lower Juan Perez Sound, 2,000 tons in Skincuttle Inlet and 1,300 tons in Louscoone Inlet.

In upper Juan Perez Sound three roe tests were made during the assessment period. The first test was made on March 10 the second on March 16 and had roe maturities of 0% and average fish size of 22.4 cm. The third test made on March 23 had a roe yield of 8% and average fish size of 21.8 cm.

In lower Juan Perez Sound roe maturities began increasing around March 19 when a test indicated a maturity of 5.3%. By March 25 roe yields were up to 11.1% and average fish size was 21.8 cm. Between March 27-30 roe maturity throughout the location ranged from 11.1 to 13.1% with the average fish size consistantly around 21.8 cm. The last day of assessment in this area was on April 4 and at this time roe maturities were still high averaging 12.5%

In Skincuttle Inlet five test were carried out between March 8-April 4. The first test on March 8 indicated a maturity of 3% and by March 13 maturity had increased to 7.2%. The maximum roe maturity for this location was 12.9% on March 18. The last test was made on April 4 and had a roe yield of 12.7%. Average fish size throughout the assessment period ranged from 21.2 - 22.4 cm.

In Louscoone Inlet there were three test made. The first on March 12 had a maturity of 12%, the second on March 13 had a maturity of 12.6% and the last on March 20 had a maturity of 13.2%. While the average fish size for this location was large ranging from 22.7-23.0 cm. there was never enough fish sounded to warrent a fishery. Between February 28 - March 12 tonnage estimates were at 2,000 tons. This estimate decreased to 1,300 ton on March 14 and remained at this level until March 27 when it declined to 400 tons.

There was no fish observed in either Cumshewa Inlet or Atli Inlet however sounding effort was were minimal because the assessment vessels were concentrating on the lower portion of Area 2E where the fishery was most likley to take place. In Selwyn Inlet 800 tons was sounded on March 20.

Fishery

Seine

The Seine fishery took place on March 31 in Burnaby Straits, Sub-areas 2-12 and 2-13 (Fig 10). The area was opened at 1045 hrs. and closed at 1131 hrs.(46 min.) and the 46 licenced seines hailed a catch of 4,157 tons. The quota for this fishery was 3,255 tons. Thirty three vessels made catches ranging from 2-450 tons and out of the vessels that caught fish there were 4 hails in excess of 200 tons and 3 hails in excess of 300 tons.

Gillnets

The Gillnet fishery took place on April 8 along the north shore of Burnaby Island in Sub-areas 2-12 and 2-13 (Fig. 11). The area was opened between 1000-1500 hrs.(5 hrs.) and the 39 licenced gillnets hailed a catch of 98 tons over the 500 ton quota.

AREA 2W

Assessment

Stock assessment began on February 27 in Port Louis and 2,000 tons were estimated in this location. By March 3 sounding estimates had increased to 4,500 tons and a roe test indicated a maturity of 0% and average fish size of 23.8 cm. By March 11 tonnage estimates had increased to 5,000 tons and then to a maximum sounding of 6,000 tons on March 15.

From March 3 to March 13 roe maturity increased to 8.8% and the average fish size was 22.9 cm slightly smaller than the previous test. On March 19 a test off Bensen Rocks just outside Port Louis had a roe yield of 16.1% but unfortunatly the weather conditions at

this time resulted in a heavy swell and prevented any possiblity for a fishery.

On March 21 a spawning started in Otard Bay and the fish previously sounded outside Port Louis began to move up ther e to spawn. Roe testing on March 22 indicated a mix of spawned and unspawned fish throughout the area thus eliminating any potential for a fishery. The fleet at this time was instructed to move to Rennel sound in anticipation of a fishery there.

In Rennel Sound initial assessment was carried out on February 27 but only 400 ton could be located. By March 4 this estimate had increased to 2,000 tons and then up to 4,000 tons on March 7. Roe testing indicated a maturity of 0% and average fish size of 22.9 cm.

Stock assessment in Rennel Sound was limited over the next two weeks due to concentration of effort in the Port Louis area. On March 11 stock estimates were still at 4,000 tons and a roe test on this day had a yield of 0.1% and average fish size of 23 cm. There was no further testing in this location until March 20 when a test in Shields Bay indicated a roe maturity of 13.3 % and average fish size of 23.2 cm. Another test on March 22 had a roe yield of 16%. Stock estimated by this time had increased to a maximum of 5,000 tons. The last test in this location prior to the fishery was made in Shields Bay on March 23 and it had a roe yield of 12.8% and average fish size of 23.5 cm.

The only other locations on the west coast of the Charlottes that were assessed and the maximum tonnage estimated in each area were: Pt. Channel-400 tons, Seal Inlet-600 tons and Inskip Channel-600 tons. There was only one roe test made and that was in Pt. Channel on March 12. The roe yield for this test was 0% and the average fish size was 19 cm.

FISHERY

Seine

The seine fishery took place on March 23 between 1252-1603 hrs.(3 hrs. 11 min.) in sub-area 2-77 (Fig. 9). There were 19 seines licenced and 17 of them hailed a catch of 2,210 tons. The quota for this area was 1,445 tons. Individual hails ranged from 52-375 tons and the roe yields were reported to be very good and were in excess of 13%.

PRINCE RUPERT (Area 3-5)

AREA 3-4

Assessment

Assessment began on March 5 but only 100 tons could be located in Emma Pass and 400 tons in Haida Bay. A survey of Stuman Bay did locate a body of fish on the bottom but no estimate of size could be given. By March 8 sounding estimates had increased to 5,600 tons with 4,000 tons in Stuman Bay and 1,000 tons in Haida Bay.

The stocks in Stuman Bay continued to increase and by March 14 were up to 10,000 tons. There was an additional 2,800 tons in Haida Bay and 600 tons in Emma Pass bringing the total sounding for the area to 13,400 tons. Roe testing carried out in Emma Pass and Stuman Bay had roe yields of 0% and 1.6% respectively. The fish in Emma Pass were very small averaging 15.1 cm. while the fish in Stuman bay averaged 20.8 cm. The maximum tonnage sounded in the area was on March 18 when 19,000 tons were estimated. Local staff felt that this increase was not necessarily due to more fish moving into the area but because the fish began to skim out at night allowing for a more accurate assessment. On March 19 fish began moving out of Stuman Bay and down towards Pearl Harbour/Big Bay. Roe maturity began increasing and a test in Pearl Harbour yielded 7.5% with an average fish size of 21.3 cm. By March 20 soundings in Pearl Harbour had increased to 6,000 tons while the estimates in Stuman Bay were down to 1,000 tons.

Roe maturities tested by seine never reached 10% and the maximum test occurred on March 22 in a sample taken off South Island. These fish had a roe maturity of 9.4% and an average size of 2.14 cm.

Once the fish move into the Pearl Harbour/Big Bay area it is very difficult to get any estimate of stock abundance because they are up in the shallows tight to the beach. Spawning began on March 22 and continued to increase daily. There was no further stock assessment after March 23.

FISHERY

Gillnets

The quota for this fishery was 1902 tons and there were 175 gillnets licensed for the area.

The first fishery occurred on March 25 with portions of Sub-areas 4-5 and 4-9 (Fig.12) opening from 0800 - 1230 hrs.(4 hrs. 30 min.). The area was closed early due to poor quality roe. On grounds testing of the fish by the processors were yielding roe percentages

ranging from 9%-11%. The hailed catch from this opening was 850 tons.

The next fishery took place on March 27 in Sub-areas 4-5, 4-7, 4-8, 4-9 (Fig 12). The area was opened between 1000 - 1530 hrs. (5 hrs. 30 min.) and the hailed catch was 1,230 tons. This brought the total catch for both openings to 2,080 tons. Roe recoveries for the second fishery were reported to be better than from the first one and ranged from 11.2% to 14.8%.

AREA 5

Assessment

Stock assessment began on March 6 but initially very few fish could be located. Between March 7-13 stock estimates ranged from 800-1,000 tons with all the fish concentrated in Willis Bay. By March 18 total tonnage had increased to 2,200 tons. The first test set was made on March 19 and the roe maturity was 4.2% and average fish size was 20.2 cm. On March 20 more fish moved into Freeman's Pass and sounding estimates increased to 1,300 tons. This brought the total stock estimate for the inlet to 3,300 tons and was the maximum tonnage sounded in Area 5 this year.

Stock estimates for this area were limited somewhat because the fish would show well one day and not show the next. Poor weather conditions also hampered the assessment.

A roe test on March 24 in Willis Bay indicated a maturity of 7% and average size of 20.0 cm. At this time the only fish that could be found was 1,500 tons in Willis Bay.

A good size spawn began near Kitkatla Creek on March 24 and a roe test taken from a set off the Gravel Pit contained all spawned out fish. This, coupled with the small size of fish in the test sets caused concern amongst both management staff and industry personnel in regards to obtaining quality fish during a fishery.

On March 29 stock size seemed to be increasing although there was no real tonnage estimate for the area. A roe test made off Gurd Island had a maturity of 7% and average fish size of 19.3 cm.

By April 1, the total tonnage estimate was 2,000 tons and remained at this level until the seine fishery occurred on April 6. These fish were mainly concentrated in Freeman's Pass but moved in and out of the inlet on the tide. Roe maturity at this time averaged 10-11.6 % and the fish size ranged from 19.8 cm.-20.6 cm.

There was no further stock assessment after the fishery.

FISHERY

Seine

The quota for the area was 1,000 tons and there were 11 seines licensed to fish. The fishery took place on April 6 from 0930-1236 hrs.(3 hrs. 6 min.) in sub-area 5-4 (Fig.13) and the hailed catch was 1,550 tons. All licensed vessels caught fish and individual sets ranged from 10-270 tons. Roe maturities were reported to be in the range of 11.2-14.2%.

CENTRAL COAST (AREA 6-10)

UPPER CENTRAL COAST (AREA 6-7)

Assessment

Area 6

Stock assessment began on March 6 at which time 2,200 ton were sounded throughout the area. Of this total 1,350 tons were in Thistle Pass and 850 tons were located in Kitasu Bay. The next day stock estimates increased to 2,800 tons with 2,500 tons in Kitasu Bay and only 300 tons in Thistle Pass. Roe testing on March 9 in Kitasu Bay indicated a maturity of 1% and average fish size of 21.7 cm. By March 12 total soundings for the area reached a peak of 6,550 tons with 2,800 tons situated in Thistle Pass and 3,750 tons in Kitasu Bay. Roe tests in Kitasu Bay by this time had increased to 7.6 %. Fish began moving out of the area on March 13 and soundings declined to 4,200 tons on that day and then down to 2,800 tons on March 14. In Kitasu Bay tonnage estimates ranged between 1,200 -1,600 ton from March 14 to March 22. The maximum roe yield test in Kitasu Bay was 10.9 % on March 22. On March 23-24, 4,000 tons were sounded in this location but these fish moved out by March 25 when estimates were down to 150 tons. In Thistle Pass tonnage estimated ranged between 300-500 tons from March 18-23 then declined to 75 tons by March 24. Only one roe test was made on the fish in Thistle Pass. This was on March 14 and the roe yield was 7.0%

Area 7

Assessment

Stock assessment began on March 1 and 6,900 tons were located in Seaforth Channel. By March 4 these fish began moving out of this location and soundings declined to 4,500 tons. At the same time soundings in Spiller Channel increased from 0 on March 3 to 1,600 tons on March 4. An additional 3,000 tons were also sounded in East

Higgins Pass. This brought the total sounding for Area 7 up to 10,000 tons.

Stock estimates continued to increase and by March 9 were up to 20,000 tons. This included 10,000 tons in Seaforth Channel, 2,000 tons in East Higgins Pass, 1,500 tons in Spiller Channel and 1,000 tons in both Waskesiu Pass and Thompson Bay.

The peak sounding for the Central Coast was on March 20 when 22,000 tons were estimated. The stocks at this time were concentrated in two areas, Spiller Channel-12,000 tons and East Higgins Pass-7,000 tons. After March 20 sounding estimated declined and ranged from 7,900-18,000 tons from March 21 to March 30 the last day that there was any assessment.

Roe maturity throughout the area remained low until March 13-14 when tests in West Waskesui Pass, Stryker Bay and East Higgins Pass had roe yields averaging 4.0%-5.3%. By March 17 the roe maturity in Spiller Channel was up to 11.8% and 12.5% on March 18. On March 22, the day prior to the seine fishery roe tests in Spiller Channel ranged from 14.3%-15.1% and average fish size was 20.5-22.0 cm.

Roe testing in other areas were limited because Spiller Channel seemed to provide the best opportunity for a seine fishery.
In East Higgins Pass a test on March 15 had a roe yield of 7.8% and average size of 21.2 cm. By March 26 roe maturities in East Higging had only increased to 11.2% and this was the last day there was any testing in this location. On March 27, roe tests in Little Thompson Bay and Stryker Bay had maturities of 16.0% and 14.5% respectively. There was no further testing after this date.

Fishery

Seine

The seine quota for the Central coast fishery was 5,378 tons and there were 69 vessels licensed for the area. The fishery took place on March 23 between 1201-1619 hrs.(4 hrs. 18 min.) in Sub-area 7-13 and 7-14 (Fig. 14). Only 68 of the 69 licensed vessels fished and they hailed a catch of 7,300 tons. Of the vessels that fished 61 caught fish and individual catches ranged from 15-310 tons. The best catches were made in and at the entrance to Neekis Inlet and around the Foote Islets. Only one roe sample was obtained from the fishery and that had a maturity of 14%.

Gillnets

There were two separate openings in the Central Area for the gillnet this year. The first took place on March 31 between 1000-1800 hrs. (8 hrs) in Sub-areas 7-3, 7-8, 7-9, 7-12, 7-19, and 7-21.(Figs.15-16) All 134 gillnets licensed for this area fished and

they hailed a catch of 1,141 tons short of the 1,446 ton quota. The main fishing locations were Powell Anchorage, Seaforth Channel and Thompson Bay.

The second open occurred on April 1 from 0800-1800 hrs.(10 hrs.) in the same sub-areas as the previous day with the addition of sub-area 7-13 (Figs. 15-16). The hailed catch from this opening was 774 tons bringing the total catch for both fisheries to 1,915 tons. Roe yields ranged from 11%-15%, and averaged 13.5%

LOWER CENTRAL COAST (AREA 8,9,10)

Assessment

In Area 8 stock assessment began on March 3 and 500 tons were located in Kwakshua Channel. By March 9 this estimate increased to 3,000 tons and then to 10,000 tons on March 10 and was the maximum tonnage sounded in this area. Between March 16-22 sounding estimates were at 3,500-4,000 tons and then declined to 1,000 tons between March 23-26. After March 26 there was no further assessment.

There was only one test set made in Area 8 and that was in Kwakshua Channel on March 9. The roe yield was 0% and average fish size was 19.4 cm.

Stock assessment was very limited in both Areas 9 & 10 due to a lack of assessment vessels. In Area 9 the maximum tonnage sounded was on March 14 when 1,700 tons were estimated. By March 17 this estimate was down to 500 tons then to 50 tons after March 21. In Area 10, 300 tons were sounded on March 22. There were no test sets made in either Area 9 or 10 this year.

STRAIT OF GEORGIA (Area 13-18)

AREA 13

Assessment

There was no acoustic assessment carried out in Area 13 this year due to the concentration of vessels and manpower in the lower portion of the Strait of Georgia where the seine and gillnet fisheries were expected to occur.

AREA 14

Assessment

In Area 14N which includes the area from Shelter Point in the north to Nile Creek in the south, stock assessment began on February 23. At this time 1,000 tons were located along the east coast of Denman

Island and another 20,000 tons were sounded off Chrome Island in Lambert Channel. A roe test taken off Shingle Spit in upper Lambert Channel indicated a maturity of 5.4% and average size of 20.5 %. Roe testing throughout the area was quite variable and a test on February 26 off Shingle spit had a maturity of 8%. By March 1 stocks had increased to 38,000 tons with 2,000 tons along the east coast of Denman Island, 30,000 tons off Chrome Island, 4,000 tons in upper Baynes Sound and 800 tons in lower Baynes Sound. Roe yields were averaging 9.5% and fish size was ranging from 19.7-20.5 cm.

Tonnage estimates continued to increase and on March 7 were up to 43,000 tons. These fish were mainly concentrated in Lambert Channel where 30,000 tons was sounded. Additionally 3,000 tons were located off Cape Lazo, 7,000 tons near Tribune Bay and 2,500 tons in lower Baynes Sound. This was the maximum tonnage sounded in this area. Three roe tests were made this day, one at Cape Lazo, one along the east shore of Denman Island and one off Tribune Bay had roe yields of 12%, 10.3% and 11.2% respectively.

Tonnage estimates declined after March 7 with soundings ranging from 22,000-35,000 tons between March 8 and the end of the assessment program on March 19. Roe maturity was somewhat variable with some tests at 8.9% and others up to 12.6%. Most tests however were greater than 10%

FISHERY

SEINE

The seine fishery took place on March 2 from 0945-1935 hrs. in sub-area 14-11 (Fig.17). The quota for this fishery was 1000 ton and the 10 licenced vessels hailed a catch of 1020 tons. Because of the difficulty in catching high quality seine roe herring in the Strait of Georgia, the licenced vessels agreed on organizing a pool fishery. This meant that only a few vessels were allowed to set at a time and all of the catch was to be shared equally amongst the 10 licenced vessels. This pool fishery was developed by the licenced fishermen on the grounds and was strictly voluntary. The division of the catch was monitered by them as well.

Gillnets

Because of the very large gillnet quota and difficulties associated with managing an excessively large fleet there were two separate gillnet fisheries in the Strait of Georgia this year. The first was a single licenced fishery in which each fisherman participating was required to have one roe gillnet licence. The second fishery was a "Two for one" licence fishery in which fishermen had to utilize two roe gillnet licences in order to participate.

The first fishery was the single licence fishery and it took place on March 17 in sub-areas 14-7 to 14-11, and 14-13 (Fig. 18). These areas were opened between 0800-1300 hrs.(5 hrs.) and the 166 licenced gillnets hailed a catch of 2,390 tons. The quota for this fishery was 1,644 tons. Fishing was good in most areas with the gear concentrated between Komass Bluffs and Sandy Islets. Just prior to the closure the hails had indicated an average catch of 2 tons/skiff/hour however once the area was closed and all the hails were tallied the average catch was in fact 3 tons/skiff/hour. This was the highest average catch ever seen for a gillnet fishery in this area.

The second fishery was the "two for one" licenced fishery and it took place over a two day period between March 18-19.

On March 18 sub-areas 14-7 to 14-11 and 14-13 (Fig. 19) were opened from 0800-1900 hrs.(11 hrs.) The 307 licenced gillnets hailed a catch of 6,754 tons which was 602 tons short of the 7,356 ton quota. Fishing was again very good for all the fleet with most of the gear situated along the Denman Island shore between Fillongley Park and Sandy Islets. The initial closure was scheduled for 1500 hrs. but was extended for 3 hrs. to try and ensure the quota was taken. Unfortunatly the catch rate dropped off during the last 1-2 hrs and the quota was not realized. The same areas were reopened at 1000 hrs on March 19 and closed at 1130 hrs (1hr. 30 min.). The hailed catch for this fishery was 700 tons bringing the total catch for the two days to 7,454 tons.

AREA 15

ASSESSMENT

Stock assessment in Area 15 was limited this year because there were very few fish located during the assessment period. Assessment began on February 25 and 5,000 tons were located between Westview Docks and Mrytle Rocks. This fish quickly moved out of the area and by February 27 tonnage estimates were down to 1,100 tons. Stock estimates ranged from 1,000 - 1,600 tons until March 6 after which no fish could be located anywhere in the area. There was only one test set made and that was on March 4 off Westview. The roe yield from this test was 3.2% and average fish size was 18.3 cm.

AREA 17

Assessment

Stock assessment in Area 17N ,which includes the area between Dodds Narrows and North West Bay, began on February 26. At this time only 100 tons could be located between Neck Point and Dodds Narrows. This estimate was increased to 300 tons on February 27 and remained

at this level until March 4 when 3,000 ton were sounded in outer Nanoose Bay. The next day the estimate was revised up to 4,000 tons and remaind at this level until March 19 when the assessment program ended. The maximun tonnage sounded in this area was 5,000 tons on March 6 and of this 4,000 tons were in Nanoose Bay, 800 tons between Dorcas Point and Schooner Point, and 200 tons between Neck Point and Blunden Point. There were 4 roe test made during the assessment period. The first was on February 24 off the NE corner of Gabriola Island and it had a 0% roe yield and average fish size of 18.5 cm. The next two sets were made on March 5-6, the first off Maude Island outside Nanoose Bay and the second off Icarus Point just down from Nanoose. The test off Maude Island had a maturity of 3.7% and fish size of 18.2 cm. while the test off Icaraus Point had a maturity of 3.3% and fish size of 19.3 cm. The last test made in this area was on March 12 off Icaraus Point and it had a maturity of 12% and average fish size of 20.4 cm.

In Area 17S, which includes Stuart Channel, Pylades Channel, and upper Trincomali Channel, the first sounding was made on February 25 and 8,000 tons were located in Trincomali Channel. A roe test indicated a maturity of 0% and fish size of 18.1 cm. Stock estimates declined to 5,000 tons by March 1 and then to 1,000 tons on March 4. On March 7 fish began moving back into the area and a test made the day before on March 6 indicated a maturity of 7.5 % and fish size of 21.1 cm. These fish quickly moved up into upper Stuart Channel between Yellow Point and Dodds Narrows as stock estimates in this location went from 0 tons on March 7 to 2,000 tons on March 9 and 10,000 tons on March 11. Stock estimates in Trincomali Channel during the same time period declined to 500 tons. Between this date and the end of assessment on March 19 tonnage estimates in Stuart Channel ranged from 5,000-8,000 tons. The maximum tonnage sounded in Area 17S was 12,000 tons on March 19 when 8,000 tons were sounded in Stuart Channel and 4,000 tons in Pylades Channel.

Two roe tests in Stuart Channel on March 7 and March 11 had roe yields of 9.3% and 11.6 % respectively. The average fish size for both tests was 20.9 cm. Another test in Pylades Channel on March 14 indicated a maturity of 11.1% and fish size of 20.4 cm. The last roe test made in this area was on March 15 in Stuart channel and it had a roe yield of 11.1% and fish size of 20.8 cm.

Area 18

Assessment

Assessment began on February 26 when 5,000 tons were sounded in Captains Pass. This was the only location in Area 18 where there was any amount of fish. This tonnage estimate remained the same until March 9 when it declined to 2,000 tons and then to 500 tons

on March 10 where it remained until the end of the assessment program.

There were three roe test made in this area all in Captains Pass. The first two were made on February 25-26 and had roe yields of 0% and average fish size of 20.5 cm. The last test on March 8, had a roe yield of 10.8% and fish size of 21.7 cm.

WEST COAST OF VANCOUVER ISLAND (Area 23-27)

AREA 23

ASSESSMENT

Stock assessment began on February 23, however no stocks were located until February 27 when 4600 tons were sounded off Amphrite Point.

By March 3 stock estimates had increased to 6500 tons with the main concentration of fish located in the west Barkley Sound area near Castle Islets. A roe test on these fish indicated a maturity of 7.7% and average length of 22.1 cm.

Stocks continued to build and by March 6 were up to 15,000 tons. Of this total 10,000 tons were located in west Barkley and 5,000 tons were located in Sechart Channel. On March 8 a further 1,000 tons were located in Imperial Eagle Channel bringing the total sounding to 16,000 tons. This tonnage was the maximum amount sounded in Barkley Sound this year and was down slightly from the 17,500 ton maximum in 1990. The fish located in Imperial Eagle Channel were only seen on one day and for the remainder of the sounding program stock estimates remained at 15,000 tons.

Roe testing continued through the assessment program and by March 4 average roe yields were up to 9.5%. Between March 5-8 roe tests ranged from 8.3% to 13.8 % and average fish size was very consistent throughout the area ranging from 21.7 cm. to 22.6 cm in length. The low roe test were made on fish holding on the outside of West Barkley between Castle Rock and Chrow Island while the high test came form fish holding on the inside between David and St. Ines Islands. On March 12 the day of the seine fishery a roe test east of Forbes Island indicated a maturity of 14.8% and average fish size of 21.1 cm.

Testing continued until March 19 when the assessment program ended. Roe maturities during this time ranged from 11.2 -15.7%. with most of the tests averaging 13-14%.

FISHERY

Seine

The seine fishery took place on March 12 between 1001-1122 hrs. (1 hr. 21 min.) in sub-areas 23-9 and 23-10 (Fig. 20). There were 70 vessels licensed for this area and they hailed a catch of 4400 tons. Fifty-four vessels caught fish and individual catches ranged from 5-220 tons. The quota for this fishery was 4708 tons. Roe quality was reported to be very good with maturities in excess of 12.5%.

Gillnet

The Gillnet Fishery took place on March 21 between 1100-1730 hrs. in sub-areas 23-9, 23-10 and a portion of 23-11 (Fig. 21). There were 145 gillnet punts licensed for this fishery and all of them took part. The quota was 1705 tons and the final hail was 2062 tons. Roe recoveries were reported to be very good, ranging from a low of 10.6% to a high of 18.6% with an overall average of 14%.

AREA 24

ASSESSMENT

For assessment purposes Area 24 is divided into two separate areas; upper Clayoquot Sound which includes Hesquiat Harbour, Sydney Inlet, and Shelter Inlet, and lower Clayoquot Sound which is comprised of Miller Channel, Cypress Bay, Father Charles Channel and Maurus Channel

In upper Clayoquot Sound stock assessment began on February 25 and 1,500 tons were located in Sydney Inlet. This was the maximum tonnage sounded in the upper Clayoquot sound area this year. A roe test on this day indicated a maturity of 4.4% and average size of 22.2 cm. Another test on February 26 indicated a maturity of 3.3% and fish size of 22.2 cm. Stock estimates remained at this level until February 28 when only 200 tons could be located. Between this date and the end of the assessment program tonnage estimates ranged from just a few tons up to 700 tons and was one of the lowest acoustic stock estimates on record for this area. The last roe test made in Sydney Inlet was on March 13 and the roe yield was 13.0% and average fish size was 21.4 cm. Stock estimates on this day were 500 tons.

In lower Clayoquot Sound, the stocks did not show up in similar strength as in the past few years and the maximum tonnage estimated was on March 16 when 1,200 tons were sounded. These fish were in two main bodies with 600 tons located in Father Charles channel and 600 tons in Maurus Channel. Sounding estimates remained at this level until the end of assessment on March 20. There were two tests made on these fish; one off Dunlop Island on March 16 had a

maturity of 11.4% and average size of 21.5 cm. while the other was made in Cypress Bay on March 17 and had a maturity of 12.5% and average size of 20.9 cm.

AREA 25

ASSESSMENT

Stock assessment in this area is also divided into two separate sections, upper and lower Area 25.

Upper Area 25 includes Esperanza Inlet, Inner Nuchatlitz, Outer Nuchatlitz and Port Langford.

In upper Area 25, stock assessment began on February 25 and 2,000 tons were sounded in Esperanza Inlet. This estimate increased to a maximum tonnage for the area of 3,700 tons on February 28. Roe maturity at this time ranged between 10.8 - 11.2 % and had an average size of 21.6 cm. Stocks began to break up and sounding estimates declined to 500 tons by March 2. On March 5 sounding had estimates increased back up to 3,000 tons and two roe tests made the day before had roe maturities of 13.35 and 14.7%. During the night of March 5 all of the fish in the area moved into the shallows of Nuchatlitz and spawned. A test set made in the morning of March 6 confirmed this as all the fish in the set were spawned out.

In lower Area 25, 800 tons were located off Nootka Light on February 25. A roe test the next day indicated a maturity of 10% and average length of 22.1 cm. Stock estimates remained at this level until March 5 when 1,400 tons were sounded. Of this total 400 tons were in Cook Channel and 1,000 tons were in the Outer Nootka Sound area off Nootka Light. Stocks continued to increase and by March 8 were up to the maximum estimate of 3,000 tons. A test set on March 9 indicated a maturity of 13.5% and average size of 21.6 cm. Another test set on March 10, the day of the seine fishery, indicated a roe maturity of 12.6%. There were no further tests made in this area because of poor weather conditions.

FISHERY

SEINE

The Nootka Sound seine fishery took place on March 10 between 1402-1631 hrs. (2hrs 29min) in sub-area 25-6 (Fig. 22). There were 14 vessels licensed for the area and all of them caught fish. The total hailed catch was 1,745 tons, well over the 1,000 ton quota. Individual catches ranged from 5-280 tons with roe recoveries being reported to be very low as a result of small fish moving in over the boundary from the outside during the fishery.

AREA 26

Stock assessment in this area was limited to two surveys by the test boat. The first survey was on March 4 when Nasparti Inlet, Ououkinish Inlet and Malksope Inlet were sounded. The only fish seen were a few small scratches at the mouth of Malksope Inlet off Whiteley Island. No test sets were made in this area.

Another survey of the area was conducted on March 17-19. There were 25-30 tons off Whiteley Island in Malksope Inlet and another 3-5 tons located in Amai Inlet. A sample of these fish was taken using herring jigs and the turned out to be juvenile herring averaging 10-13 cm. in length.

AREA 27

ASSESSMENT

There was very little assessment effort in Area 27 this year due to the limited number of sounding platforms available and the requirement for the test vessel assigned to the area to assist in the Area 25 seine fishery.

Stock assessment commenced on March 1 and 200 tons were located in Foreward Inlet on this day. This estimate was increased to 1,500 tons the next day as more extensive surveys were carried out. There was one roe test made on these fish and they had a maturity of 7.2% and average size of 21.6 cm.

On March 2 stock assessment was also carried out in Klashkish Inlet where 2,000 tons were sounded. These fish were tested at 11% and had an average size of 22.7 cm.

The last day that there was any assessment in this area was on March 7 and 2,500 tons were located in Foreward Inlet.

SPAWN-ON-KELP

Spawn-on-kelp harvesting has been permitted by regulation in British Columbia since 1975. This year 10 new native band licences were created bringing the total number of licences to 38. The new licences were a result of a Ministerial decision to increase native participation in the fishery and provide income for some of the remote bands. In order to obtain a new licence the band had to relinquish either six roe herring gillnet or one roe herring seine licence, have a localized population of spawning herring in their band area and have access to the appropriate type of kelp.

All Spawn-on-kelp licences are issued on an annual basis and each licence authorizes the landing of 16,000 lbs. of product. Landed weights allow for an additional 5% to account for residual salt in

the totes in which the product is shipped from the grounds to the processing plant.

Until 1983, a " closed" pond method was used to obtain the product and involved seining sexually mature herring, towing them to a sheltered bay and releasing them into floating pens. These pens are constructed from log frames from which seine web is suspended to form an enclosure. The pond frames are anchored to the bottom and/or tied to the shore. Good quality kelp (Macrocystis integrifolia) is harvested from nearby locations and approximately 2 m. lengths of kelp are tied to weighted lines and suspended in the ponds. Once the herring have spawned on the kelp the product is harvested salted and sent to processing plants.

In 1982 a study by Shields and Kingston (1982) revealed two majors concerns with this type of fishery. The first was that a high rate of mortality could occur if the herring were held too long or were over crowded, and the second was that in 12 out of 18 ponds observed, the percentage of female herring that spawned in the impoundment was never greater than 50%. As a result of this study and the concern over the high mortality rate, a new method of harvesting was developed to minimize the problems. This "open" pond method described by Shields and Watson (1983) involves suspending kelp from log frames and towing them through areas where active spawning is in progress. This method has two advantages in that there is no handling of the herring which eliminates injury and/or mortality, and since the herring are spawning in a natural state it is believed that all of the herring spawn. At present some of the Spawn-on-Kelp operators are using a combination of "open" and "closed" ponds to obtain their quotas.

Management Plans for the Spawn-on-kelp fishery were issued to licence holders in January 1991, (Appendix 3). These plans detail the licensing requirements and inspection guidelines for the 1991 fishery.

Preliminary production figures for 1991 indicate a total of 622,819 lbs. of product were harvested coastwide with an approximate landed value of 8-9 million dollars. This represents an average production of 16,833 lbs. per licence (Only 37 of the 38 licences operated this year). Any product harvested in excess of the individual quota is relinquished by the fishermen to the Fisheries Department and sold at public auction by Crown Assets. Of the total amount of product landed, 409,763 lbs. (66%) was graded as Number 1 and 139,565 lbs. (22%) was graded as Number 2. It should be noted that while production was up due to the increase in number of licences issued, the total value of the produced was similar to 1990 and is a reflection of a drop in market value of the product.

The total production for 1991 compares with 481,461 lbs. harvested in 1990, 459,046 lbs. harvested in 1989, and 467,361 lbs. harvested

in 1988. The average production coastwide for the years 1986-90 has been 435,379 lbs.

The distribution of licences and production by area in 1991 was as follows:

Location	No. Licences(*)	Tot. Production
1. Queen Charlotte Islands	12 licences (11)	213,363 lbs.
2. Prince Rupert	9 licences (8)	144,131 lbs.
3. Central Coast	7 licences (5)	125,315 lbs.
4. West Coast Vancouver Isl.	8 licences (4)	123,928 lbs.
5. Johnston Strait	2 licences (0)	16,082 lbs.

(*) The numbers in brackets represents the number of SOK licences issued for each area in 1990. One of the new licences assigned to the WCVI did not operate in 1991.

1991 HERRING SPAWN SUMMARY

The coastwide Spawn Area Index (SAI) for 1991 was 34,418 SAI (Table 12) and is down considerably from the 52,668 SAI recorded in 1990, 46,204 SAI recorded in 1989 and a 1986-1990 average of 39,939 SAI. The decrease this year is a result of declines in spawning in both the North and South coast areas. Of the total spawn measured this year, 30,525 SAI (89%) was measured by divers and the remaining 3,893 SAI was measured by Fisheries Field and Marine staff using the standard shore based methods.

In the North Coast (Areas 1-10) the total amount of spawn recorded was 13,911 SAI (Table 11) and is down from the 21,468 SAI recorded in 1990. There was 12,200 SAI (88%) measured by divers and this compares with the 84% and 72% measured by divers in 1990 and 1989 respectively.

In the South Coast (Areas 11-29), 20,507 SAI of spawn was recorded (Table 12). This compares with the 31,200 measured in 1990. Of the total amount of spawn recorded this year 18,324 SAI was measured by divers (86%) and compares with 86% and 73% measured by divers in 1990 and 1989 respectively. Both the Strait of Georgia and West Coast of Vancouver Island areas exhibited large declines in spawnings this year.

Individual spawn locations and measurements are listed alphabetically in Table 13.

The following is a brief narrative of the spawnings in each District.

Queen Charlotte Islands (Areas 1,2E,2W)

There has been no spawn survey carried out in Area 1 since 1985 when 674 SAI was recorded. There are several reason for the lack of effort in this area. One reason is the spawnings here tend to be small and occur over a long period of time between January and April making surveys difficult. Additionally spawn survey effort is concentrated on the major spawnings located in Areas 2E and 2W. Secondly, manpower is limited and effort is concentrated on the Roe Herring and Spawn-on-kelp fisheries that take place at this time. Additionally spawn survey effort is concentrated on the major spawnings occurring in Areas 2E and 2W.

In Area 2W, the 947 SAI recorded is down from the 3,010 SAI measured in 1990. And while this is the second year that diving surveys have been conducted in the area, poor weather conditions severely restricted the operations and it is difficult to say if the decline in spawn is a result of low escapement or lack of survey coverage. The diving surveys were carried out in all areas except Inskip Channel.

The largest spawning occurred in Otard Bay where 537 SAI was measured. Other spawnings took place in Rennel Sound-143 SAI, and Louscoone Inlet-166 SAI. The surface survey in Inskip Channel located 99 SAI of spawn.

On the east coast of the Queen Charlottes almost all of the spawn was surveyed by divers and has been done this way since 1988. The only location that any surface surveys were done was in Cumshewa Inlet where 16 SAI was recorded.

The 3,650 SAI measured this year is down from the 5,726 SAI measured in 1990. The majority of the spawning occurred in lower Juan Perez Sound between Scudder Point and Alder Island (2,868 SAI). In Skincuttle Inlet, the other major spawn location on the east coast, 225 SAI was measured in Huston Inlet. Additional spawnings occurred in Selwyn Inlet (508 SAI) and Dana Inlet (32 SAI).

Prince Rupert (Areas 3-5)

In the Prince Rupert area all of the spawns have been measured by divers since 1988. This year a total of 4,985 SAI was recorded and is a decline from 1990 when 5,816 SAI was measured.

In Area 3 the 234 SAI measured is up from the 177 SAI measured in 1990. Spawning occurred in Port Simpson (25 SAI), Stuman Bay (25 SAI) and along the east shore of Finlayson Island (184 SAI).

In Area 4 the total spawn recorded was 3,844 SAI and while it is well below the 5,096 SAI recorded in 1990 it is still close to the 1988-90 average of 4,367 SAI. As is normal for this area the major

spawning occurred along the west side of Finlayson Island in the north down to Tugwell Island in the south. The biggest single spawnings were around Belletti Point (596 SAI) and in Big Bay itself (420 SAI). Further spawnings occurred along the north shore of Porcher Island and in Hunts Inlet where a total of 602 SAI was measured. In 1990 only 35 SAI of spawn was measured in and around Hunts Inlet.

In Area 5 spawning increased from last year with 907 SAI being recorded. In 1990 only 543 SAI was measured and the 1988-90 average for this area in 1,024 SAI. Most of the spawning occurred inside the inlet around Gurd Island, Absalom Island, Dries Inlet, Clamshell Island and Freemans Pass. A surface survey was carried out in Ala Pass, between Anger Island and Pitt Island in Principe Channel. It was a small spawn with only 11 SAI being measured.

Central Coast (Areas 6-10)

The 4,328 SAI recorded for the Central Coast this year is down considerably from the 6,916 SAI measured in 1990. Of this total 2,745 SAI were measured by divers (63%) while the rest was measured by the shore based method. In 1990 54 % of the spawns were measured by divers.

In Area 6 the total amount of spawn recorded was 898 SAI and of this 477 SAI (53%) was measured by the surface survey method and 420 SAI (47%) was measured by divers. The spawning in this area has declined dramatically in the past three years and is at it's lowest level since 1981 when the SAI was first used as an index of spawn.

Surface surveys were carried out in Kitimat Arm where 177 SAI of spawn was measured from the head of the arm along the east shore to Kildella Arm and around Coste Island. Other surface surveys were carried out in West Higgins Pass (28 SAI), along the west shore of Price Island (204 SAI), in Osment Inlet (30 SAI) and along the west side of Hastings Island near Thistle Pass (18 SAI)

Dive surveys were done in Kitasu Bay between Wilby Point and Osment Osment Inlet. The dive surveys in Osment Inlet were done in different locations than those carried out by the surface surveys. In locations where both surface and dive surveys are carried out on the same spawning it is the dive surveys that are recorded.

In Area 7, 2,531 SAI of spawn was recorded and is down by almost 50% from the 4,839 SAI recorded in 1990. This year 92% of the spawn was measured by divers while in 1990 only 54 % was measured by divers.

Surface surveys were carried out in Spiller Channel (186 SAI), Berry Inlet (10 SAI), Spider Anchorage/Kildit Sound (8 SAI) and in Joassa Channel (1 SAI).

Of the 2,324 SAI recorded by divers, 1,724 SAI occurred between Port Blackney and Berry Inlet and included spawnings in Powell Anchorage, Reid Pass and Ivory Island.

Other dive surveys were carried out in East Higgins Pass (336 SAI) and in the Stryker Bay/ Thompson Bay area (264 SAI).

In Area 8 all spawns were measured by surface surveys and the 377 SAI recorded was up from the 254 SAI measured in 1990 but still below the 1988-90 average of 406 SAI. The major spawnings occurred in Kwakume Inlet (145 SAI), Illahie Inlet (117 SAI), and Namu Harbour (104 SAI). Small spawnings were also recorded in Pruth Bay (6 SAI) and North and South Bentinck Arms (5 SAI).

In Area 9, spawnings continue to increase and the 404 measured by surface surveys this year compares with the 254 SAI measured in 1990. The 1986-90 average for this area is 152 SAI. The majority of the spawn was measured at the head of Rivers Inlet where 379 SAI was recorded. The other 25 SAI was measured in Kilbella Bay.

In Area 10, 118 SAI was measured by surface surveys and represents a dramatic increase from the 7 SAI recorded in 1990. The spawning took place along the Indian Island shore between Wakas Point and into Anchor Bight (78 SAI) and in Takush Harbour (39 SAI).

Georgia Strait/Johnstone Strait (Areas 11-20)

<u>Upper East Coast</u> (Area 11-12)

Similar to 1990 no spawn surveys were carried out in Area 11 due to a lack of manpower and vessel availability.

In Area 12, 181 SAI of spawn was recorded and is down from the 447 SAI measured in 1990. The largest spawning was along both shorelines in Knights Inlet from Glacier Bay to the head of the inlet. The 80 SAI recorded there this year is well below the 1990 level of 248 SAI.

In addition to the spawning in Knight Inlet, 52 SAI was measured in Kingcome Inlet, 46 SAI recorded in Wakeman Sound and only 4 SAI recorded in Fort Rupert (Beaver Harbour).

<u>Middle East Coast</u> (Areas 13-16)

In Area 13 virtually all of the spawning occurred in Bute Inlet where 110 SAI was measured. Of this total 91 SAI was recorded in Bear Bay, 16.3 SAI in Waddington Harbour and 3 SAI in Orford Bay. Spawns of less than 1 SAI were recorded in both Loughborough Inlet and Deepwater Bay.

In 1990 only 26 SAI was measured in all of Area 13 and there were no spawnings recorded here in either 1989 or 1988.

In Area 14 all spawnings since 1986 have been measured by divers. Spawning in Area 14 continues to decline and the 10,608 SAI recorded this year is down from 1990 and 1989 when 14,055 SAI and 16,041 SAI were recorded respectively. The 1986-90 average for this area is 10,088 SAI.

All of the spawning occurred between Cape Lazo on Vancouver Island and Whaling Station Bay on Hornby Island . There was no spawn observed along the Qualicum Beach shoreline this year.

There were no spawns observed in either Area 15 or 16 this year. In 1990 Area 15 had a small spawn of 32 SAI while Area 16 has had no spawn recorded since 1987 when 1.9 SAI was measured. Fisheries field staff working in the area felt that coverage was the same as in past years and that there was no spawn that went unobserved.

Lower East Coast (Areas 17-19)

In Area 17 spawning is well below average and the 912 SAI measured this year is down from 1990 when 3,994 SAI was recorded. The 1987-90 average for this area is 2107 SAI. Diving surveys have been carried out in this area since 1987 and it was felt by Fisheries field staff that there was no spawn in this area that was not measured. All of the spawn occurred in a continuous line along the east side of Vancouver Island from Coffin Point up towards Boat Harbour.

Area 18 had one of the best spawnings in many years and the 412 SAI recorded in Ganges Harbour was the best in recent history. The last year that there was any appreciable amount of spawn recorded was 1981 when 314 SAI was measured. The 1986-90 average for this area is only 12 SAI.

In Area 19 spawning is very sporadic and the 55 SAI measured is up from last year when there was no spawn recorded but down from 1989 when a record 132 SAI was measured. Prior to that year no spawn had been observed in this area since 1974 and that was a very small spawn.

West Coast Vancouver Island (Area 23-27)

Lower West Coast (Area 23-24)

In Area 23 all spawns were measured by divers and have been since 1985. This year 5,368 SAI of spawn was recorded and is up slightly from the 4796 SAI measured in 1990 and still above the 1986-90 average of 4,437 SAI. The spawn was deposited along the Vancouver Island shoreline between Newcombe Channel and Toquart Bay and around the islands in Macoah Pass. There was also some spawning in Ucluelet Harbour.

In Area 24 both dive and surveys were carried out and a total of 1,274 SAI of spawn was measured. This is well below the 1990 level of 3,739 SAI and 1987-90 average of 3,939 SAI. Surface surveys were carried out in Hesquiat Harbour, in Calmus Pass along the Catface Range and in Epper Pass. In Hesquiat Harbour 712 SAI of spawn was measured while 74 SAI was recorded in Epper Pass and 7 SAI in Calmus Pass.

The dive survey was carried out on Elbow Bank and around Rassier Point. There was only 411 SAI recorded here and is down considerably from the 1,067 SAI measured on Elbow Bank in 1990. There was no spawning on Yellow Bank or down near Tofino along the Yarksis shore and around Stubbs Island where normally a large percentage of the spawn would occur.

Upper West Coast (Areas 25-27)

In Area 25 spawnings occurred in both Nootka Sound and Esperanza Inlet. Diving surveys were done in both areas and a total of 638 SAI was measured. This is well below the 2,116 SAI measured in 1990 and the 1986-89 average of 1,393 SAI. The spawning was divided almost equally between the two locations with 293 SAI recorded in Nootka Sound and 344 SAI in Esperanza Inlet.

The spawn in Nootka Sound occurred in McKay Pass along the Saavedra Islands and in Friendly Cove.

In Esperanza Inlet all of the spawning occured in Outer Nuchatlitz and this years level is one of the lowest on record. There was no spawn observed in either Port Langford or Inner Nuchatlitz where normally there is at least some record of spawn.

There was no spawn observed in Area 26 this year.

In Area 27 a total of 949 SAI was measured a represents a decline from the past two years when 1,994 SAI was recorded in 1990 and 1,500 SAI in 1989.

Diving surveys were carried out in Klashkish Inl et and the 388 SAI recorded this year was very close to the 365 SAI measured in 1990. The spawning took place on McDougal Island, along the east shore of Klashkish Inlet and in Klashkish Anchorage.

Surface surveys were carried out in Foreward Inlet where 560 SAI was measured. All of the spawning took place at the entrance to North Harbour, around Matthews Island and between Hazard Point and Greenwood Point.

Fraser River (Area 29)

There were no spawns observed in the Boundary Bay area this year.

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TABLE 1 –Distribution of Herring Licences by Roe Herring Area and Gear Type, 1991

Roe Herring Area	Seines	Gillnets
Queen Charlotte Islands 2E	46	39
Queen Charlotte Islands 2W	19	---
Prince Rupert	11	175
Central Coast	69	134
Strait of Georgia (single)	10	166
Strait of Georgia (double)	--	307 *
West Coast Vancouver Island (s)	70	145
West Coast Vancouver Island (n)	14	---
Total	239 **	966

* Double Licenced Skiffs (required two GN licences to fish this Area)

** Seine total does not include 13 chartered seiners.

TABLE 2 – Roe Herring Quotas (Tons) by Roe Herring Area, 1991

Roe Herring Area	Seines	Gillnets	Total
Queen Charlotte Islands 2E	3255	500	3755
Queen Charlotte Islands 2W	1445	----	1445
Prince Rupert	1000	1902	2902
Central Coast	5378	1446	6824
Strait of Georgia (single)	1000	1644	2644
Strait of Georgia (double)	----	7356	7356
West Coast Vancouver Island (s)	4708	1705	6413
West Coast Vancouver Island (n)	1000	----	1000
Total	17786	14553	32339
Target Catch Division	55%	45%	

TABLE 3 – Hailed Catches (Tons) by Gear and Roe Herring Area, 1991

Roe Herring Area	Seines	Gillnets	Total
Queen Charlotte Islands 2E	4157	598	4755
Queen Charlotte Islands 2W	2210	----	2210
Prince Rupert	1550	2080	3630
Central Coast	7300	1915	9215
Strait of Georgia (single)	1020	2390	3410
Strait of Georgia (double)	----	7454	7454
West Coast Vancouver Island (s)	4400	2062	6462
West Coast Vancouver Island (n)	1745	----	1745
Total	22382	14437	38881
Achieved Catch Division	57.6%	42.4%	

TABLE 4 - Sales Slip Catch Data (Tons) by Roe Herring Area, 1991.

Roe Herring Area		Seines	Gillnets	Total
Queen Charlotte Islands	2E	4164	582	4746
	2W	2163	-----	2163
Prince Rupert		1486	2325	3811
Central Coast		7268	1952	9220
Strait of Georgia(s)		1247	2188	3435
Strait of Georgia(d)		-----	8124	8124
West Coast Vancouver Is.(n)		1791	-----	1791
West Coast Vancouver Is.(s)		4415	2583	6998
	Total	22534	17754	40288

TABLE 5 - Hailed Roe Herring Catch (Tons) Area 1 (Queen Charlotte Islands) by Statistical Area and Gear Type, 1986 - 1991

Hailed Catch (Tons) by Statistical Area

Year	Gear	2E	2W	Total	YEAR TOTAL
1986	SN	3143	----	3143	4067
	GN	924	----	924	
1987	SN	2061	----	2061	2061
	GN	----	----	----	
1988 *	SN	----	----	----	----
	GN	----	----	----	----
1989	GN	----	----	----	
	SN	----	1245	1245	1245
1990	GN	1247	----	1247	8792
	SN	5800	1745	7545	
1991	GN	598	----	598	6965
	SN	4157	2210	6367	

* FISHERY CLOSURE ON QCI DUE TO LACK OF STOCKS

TABLE 6 – Hailed Roe Herring Catch (Tons) Prince Rupert by Statistical Area and Gear Type, 1986 – 1991

Hailed Catch (Tons) by Statistical Area

Year	Gear	3	4	5	Total	Year Total
1986	SN	----	----	3606	3606	8606
	GN	----	5000	----	5000	
1987	SN	----	----	2118	2118	6587
	GN	(---- 4469---------)		----	4469	
1988	SN	----	----	3800	3800	8829
	GN	(---- 5029---------)		----	5029	
1989	SN	----	----	3541	3541	8813
	GN	(---- 5272---------)		----	5272	
1990	SN	----	----	1706	1706	4206
	GN	(---- 2500---------)		----	2500	
1991	SN	----	----	1550	1550	3630
	GN	----	2080	----	2080	

TABLE 7 – Hailed Roe Herring Catch (Tons) Central Coast by Statistical Area and Gear Type, 1986 – 1991

Hailed Catch (Tons) by Statistical Area

Year	Gear	6	7	8	Total	Year Total
1986	SN	2112	----	----	2112	3207
	GN	(------ 1095-------)		----	1095	
1987	SN	(------ 2673-------)		----	2673	3652
	GN	(------ 979-------)		----	979	
1988	SN	(------ 3583-------)		----	3583	4519
	GN	(------ 936-------)		----	936	
1989	SN	----	6257	----	6257	8953
	GN	(------ 2696-------)		----	2696	
1990	SN	----	5139	----	5139	8281
	GN	(------ 3142-------)		----	3142	
1991	SN	----	7300	----	7300	9215
	GN	----	1915	----	1915	

TABLE 8 – Hailed Roe Herring Catch (Tons) Strait of Georgia by Statistical Area and Gear Type, 1986 – 1991

Hailed Catch (Tons) by Statistical Area

Year	Gear	14	15	17	Total	YEAR TOTAL
1986 *	SN	----	----	----	----	----
	GN	----	----	----	----	
1987	SN	----	3432	----	3432	10072
	GN	2417	----	4223	6640	
1988	SN	1715	----	----	1715	8685
	GN	6970	----	----	6970	
1989	SN	1716	----	----	1716	8120
	GN	6404	----	----	6404	
1990	SN	----	----	----	----	8255
	GN	** 8255	----	**	8255	
1991	SN	1020	----	----	1020	10864
	GN	9844	----		9844	

* FISHERY CLOSED IN STRAIT OF GEORGIA DUE TO LACK OF STOCKS

** COMBINED CATCH FOR AREA 14 AND 17

TABLE 9 – Hailed Roe Herring Catch (Tons) West Coast of Vancouver Island by Statistical Area and Gear Type, 1986 – 1991

Hailed Catch (Tons) by Statistical Area

Year	Gear	23	24	25	27	Total	YEAR TOTAL
1986 *	SN	----	----	----	----	----	----
	GN	----	----	----	----	----	
1987	SN	15143	----	----	----	15143	17953
	GN	----	----	2810	----	2810	
1988	SN	5700	2690	----	----	8390	9890
	GN	----	1500	----	----	1500	
1989	SN	10091	----	----	----	10091	13783
	GN	3692	----	----	----	3692	
1990	SN	7294	----	----	----	7294	9489
	GN	----	2195	----	----	2195	
1991	SN	4400	----	1745	----	6145	8207
	GN	2062	----	----	----	2062	

* FISHERY CLOSURE ON WCVI DUE TO LACK OF STOCKS

TABLE 10 Landed Weight and Value of British Columbia Roe Herring catches 1980 – 1990 (Sales Slip Data – does not include Roe Herring Charter payment or seized fish)

Year	Landed Weight (tons)	Landed Value * ($ millions)
1980	19,330	23.91
1981	32,087	32.62
1982	29,593	31.58
1983	39,058	46.45
1984	33,379	39.14
1985	25,691	36.35
1986	15,681	39.24
1987	38,790	91.33
1988	30,786	81.00
1989	42,016	57.00
1990	41,391	78.00
1991	40,287 **	66.00

* Estimated value based on average price paid for seine and gillnet fish
** Preliminary Estimate of landed catch

TABLE 11

SPAWN AREA INDEX (LENGTH *WIDTH * PERCENT COVER * LAYERS) FOR THE NOTHERN COASTAL WATERS OF BRITISH COLUMBIA FROM 1986 TO 1991 BY HERRING SUB-DISTRICT AND STATISTICAL AREA.

	SPAWNING YEARS							
AREA	1986	1987	1988	1989	1990	1991	Average	Years
Queen Charlotte Island								
1	NS	NS	NS	NS	NS	NS	NS	
2E	945.6	1455.6	3075.8 *	3529.6 *	5725.8 *	3650.4 *	4110.4	1988-90
2W	158.7	166.5	511.4	2286.3	3010.3 *	946.8 *	780.7	1986-89
Total	1104.3	1622.1	3587.2	5815.9	8736.1	4597.2		
Northern								
3	17.4	554.1	688.3 *	514.1 *	177.2 *	234.3 *	459.9	1988-90
4	6246.7	7140.1	6046.5 *	1959.8 *	5095.8 *	3843.6 *	4367.4	1988-90
5	1252.8	2015.5	875.7 *	1655.6 *	543.1 *	907.28 *	1024.8	1988-90
Total	7516.9	9709.7	7610.5	4129.5	5816.1	4985.2		
Upper Central								
6	1604.7	1599.8	974.8	1690.6 *	1513.3 *	897.93 *	1602.0	1989-90
Total	1604.7	1599.8	974.8	1690.6	1513.3	897.9		
Lower Central								
7	1372.7	1431.6	6154.1 *	2397.4 *	4839.2 *	2530.6 *	4463.6	1988-90
8	196.4	442.3	830.2	306.2	253.7	377.5	405.8	1986-90
9	87.2	209.0	95.6	64.6	302.6	404.3	151.8	1986-90
10	350.7	41.4	31.7	93.7	7.5	117.9	105.0	1986-90
Total	2007.0	2124.3	7111.6	2861.9	5403.0	3430.3		
TOTAL N. COAST	12233	15056	19284	14498	21468	13911		

* Spawn area index based on combined dive and surface survey information.

NOTE: Due to the different methods used in measuring spawns by dive and surface surveys, valid comparisons between the S.A.I. calculated from each type of survey CANNOT be made. In areas where there is a history of dive survey information, averages for those years have been calculated (Asterixed years), and comparisons can be made between those years. Additionally in area where only surface surveys have been carried out averages have also been calculated for comparison.

NS – NO SPAWN SURVEY CARRIED OUT

TABLE 12

SPAWN AREA INDEX (LENGTH *WIDTH * PERCENT COVER * LAYERS) FOR THE SOUTHERN COASTAL WATERS OF BRITISH COLUMBIA FROM 1986 TO 1991 BY HERRING SUB-DISTRICT AND STATISTICAL AREA.

	SPAWNING YEARS							
AREA	1986	1987	1988	1989	1990	1991	Average	Years
Upper East Coast								
11	16.3	4.9	0.5	0.2	NS	NS	5.5	1986-89
12	264.2	262.5	828.4	372.5	447.0	181.4	434.9	1986-90
Total	280.5	267.4	828.9	372.7	447.0	181.4		
Middle East Coast								
13	7.7	61.1	0.0	0.0	26.5	110.4	19.1	1986-90
14	8977.7 *	5861.1 *	5504.2 *	16041.5 *	14054.9 *	10607.9 *	10087.9	1986-90
15	917.6	212.8	860.6	310.3	32.5	0.0	466.7	1986-90
16	0.0	1.9	0.0	0.0	0.0	0.0	0.4	1986-90
Total	9903.0	6136.9	6364.8	16351.8	14113.9	10718.3		
Lower East Coast								
17	1373.9	1836.3 *	1709.0 *	888.2 *	3993.6 *	911.7 *	2106.8	1987-90
18	47.6	0.0	0.0	11.1	0.0	412.5	11.7	1986-90
19	0.0	0.0	0.0	132.0	0.0	55.1	26.4	1986-90
Total	1421.5	1836.3	1709.0	1031.3	3993.6	1379.3		
Lower West Coast								
23	4710.1 *	2487.7 *	4098.9 *	6092.2 *	4795.7 *	5367.6 *	4436.9	1986-90
24	567 0	2561.2 *	4407.1 *	5047.2 *	3738.9 *	1273.7 *	3938.6	1987-90
Total	5277.1	5048.9	8506.0	11139.5	8534.6	6641.3		
Upper West Coast								
25	1210.8	1549.1	1510.4	1302.6	2116.4 *	638.0 *	1393.2	1986-89
27	293.5	890.7 *	1197.4	1500.3 *	1994.5 *	948.8 *	1461.8	1987/89/90
Total	1504.3	2439.8	2707.8	2802.9	4110.8	1586.8		
Southern Mainland								
29	0.0	0.0	17.1	8.0	NS	NS	6.3	1986-89
Total	0.0	0.0	17.1	8.0	0.0	0.0		
TOTAL SOUTH COAST	18386	15729	20134	31706	31200	20507		
TOTAL COAST	30619	30785	39418	46204	52668	34418		

* Spawn area index based on combined dive and surface survey information.

NOTE: Due to the different methods used in measuring spawns by dive and surface surveys, valid comparisons between the S.A.I. calculated from each type of survey CANNOT be made. In areas where there is a history of dive survey information, averages for those years have been calculated (Asterixed years), and comparisons can be made between those years. Additionally in area where only surface surveys have been carried out averages have also been calculated for comparison.

NS – NO SPAWN SURVEY CARRIED OUT IN AREA.

Table 13

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 2W: West Coast Q.C.I.							
Surface Survey							
Herring Section: 005							
Inskip Channel	25/Apr	27/Apr	50	50	2.00	100	5.00
Inskip Channel	25/Apr	27/Apr	100	20	1.95	100	3.90
Inskip Channel	25/Apr	27/Apr	200	5	2.40	100	2.40
Inskip Channel	25/Apr	27/Apr	200	5	2.10	100	2.10
Inskip Channel	25/Apr	27/Apr	225	25	2.70	100	15.19
Inskip Channel	25/Apr	27/Apr	300	3	1.50	100	1.35
Inskip Channel	25/Apr	27/Apr	400	8	1.97	100	6.32
Inskip Channel	25/Apr	27/Apr	550	12	1.60	100	10.56
Inskip Channel	25/Apr	27/Apr	625	8	1.80	100	9.00
Inskip Channel	25/Apr	27/Apr	700	11	2.00	100	15.40
Inskip Channel	25/Apr	27/Apr	800	15	1.90	100	22.80
Inskip Channel	25/Apr	27/Apr	900	5	1.10	100	4.95
Surface Survey Area Total							98.97
Dive Survey							
Herring Section: 002							
Otard Bay	21/Mar	25/Mar	3900	66	3.70	39	371.09
Bottom				66	2.19	30	167.54
Herring Section: 003							
Clonard Bay	04/Apr	06/Apr	3600	38	1.42	55	104.90
Bottom				38	1.34	14	25.45

Table 13 (cont'd) HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Macrocystis			2025	29	2.90		29.01
Herring Section: 006							
Louscoone Inlet	26/Mar	29/Mar	2710	50	1.10	18	26.62
Bottom				50	0.40	1	0.77
Macrocystis			1000	60	0.50		18.10
Louscoone Inlet East	26/Mar	29/Mar	3500	39	1.01	56	76.96
Bottom				39	0.72	37	36.89
Macrocystis			1000	28	5.75		32.34
Skindaskun Island	26/Mar	29/Mar	3840	6	0.54	50	6.27
Bottom				6	0.43	47	4.69
Macrocystis			1000	3	0.17		1.13
Dive Survey Area Total							901.77

Statistical Area 2E: East Coast Q.C.I.

Surface Survey

Herring Section: 023							
Conglomerate Point	01/Apr	01/Apr	3600	10	0.50	90	16.20
Surface Survey Area Total							16.20

Dive Survey

Herring Section: 021							
Alder Island	07/Apr	13/Apr	930	53	1.05	49	25.48

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Macrocystis			500	37	3.00		1.86
Alder Island Creek	07/Apr	13/Apr	3690	78	2.70	58	446.54
Bottom				78	1.93	15	82.91
Macrocystis			1000	20	3.75		1.41
Saw Reef	07/Apr	13/Apr	1900	89	1.15	28	54.04
Bottom				89	0.75	8	9.67
Macrocystis			1000	23	2.25		2.70
Scudder Point	07/Apr	13/Apr	6390	175	2.27	40	1003.95
Bottom				175	1.72	57	1092.27
Macrocystis			6390	120	3.55		131.60
Section Cove	07/Apr	13/Apr	2880	26	1.63	50	60.08
Bottom				26	0.89	13	8.90
Macrocystis			1000	23	4.75		10.93
Herring Section: 024							
Dana Inlet	14/Apr	16/Apr	4250	24	0.49	37	17.95
Bottom				24	0.58	9	5.32
Macrocystis			4250	16	1.79		11.42
Lagoon Inlet	14/Apr	16/Apr	3960	20	1.05	54	44.69
Bottom				20	1.17	18	16.77
Macrocystis			1000	11	1.10		0.39
Sewell Inlet	14/Apr	16/Apr	3000	36	1.87	53	106.31
Bottom				36	0.91	10	9.61
Thurston Harbour	14/Apr	16/Apr	3130	30	0.71	57	37.44
Bottom				30	0.67	19	11.51
Macrocystis			3130	18	2.05		18.45
Thurston Harbour	14/Apr	16/Apr	2780	30	0.70	43	24.66
Traynor Creek	14/Apr	16/Apr	4300	46	1.62	36	115.36
Bottom				46	1.80	36	129.78
Macrocystis			1000	14	2.50		3.16

Table 13 (cont'd) HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Herring Section: 025							
Huston Inlet East	31/Mar	02/Apr	2720	41	2.23	56	140.13
Bottom				41	1.39	31	47.70
Huston Inlet West	31/Mar	02/Apr	1930	22	1.32	35	19.35
Bottom				22	1.29	34	18.30
Dive Survey Area Total							3710.61
Statistical Area 03: Nass							
Dive Survey							
Herring Section: 033							
Finlayson Island East	12/Apr	16/Apr	4520	46	1.25	59	152.98
Bottom				46	0.44	35	31.53
Port Simpson	12/Apr	16/Apr	880	32	1.14	66	21.31
Bottom				32	0.63	19	3.36
Stumaun Bay	12/Apr	16/Apr	1380	64	0.68	41	24.86
Bottom				64	0.25	1	0.23
Dive Survey Area Total							234.27
Statistical Area 04: Skeena							
Dive Survey							
Herring Section: 042							

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Belletti Point	26/Mar	31/Mar	3450	170	1.75	50	519.12
Bottom				170	1.39	9	76.66
Big Bay	23/Mar	30/Mar	5860	109	1.44	46	417.95
Bottom				109	0.50	1	1.71
Burnt Cliff Island	26/Mar	29/Mar	3560	74	1.06	43	119.48
Bottom				74	0.56	18	26.84
Finlayson Island West	12/Apr	16/Apr	2900	76	1.46	41	132.22
Bottom				76	0.73	41	65.83
Pearl Harbour	25/Mar	27/Mar	1730	57	0.54	74	39.77
Reeks Point	23/Mar	24/Mar	2590	27	0.52	27	9.62
Swamp Island	25/Mar	31/Mar	3420	206	3.03	43	926.49
Bottom				206	0.90	23	147.14
Tree Bluff	23/Mar	29/Mar	5820	133	2.39	39	722.30
Bottom				133	1.00	7	54.48
Tugwell Island	16/Apr	18/Apr	740	579	0.42	55	99.52
Bottom				579	0.15	18	11.35
Herring Section: 043							
Creak Point	11/Apr	16/Apr	750	38	0.38	34	3.59
Macrocystis			3100	134	1.50		177.40
Hunt Inlet	11/Apr	16/Apr	450	7	1.00	53	1.68
Bottom				7	1.00	17	0.53
Macrocystis			1500	17	1.33		2.91
Hunt Inlet	11/Apr	16/Apr	2550	32	0.37	51	15.48
Bottom				32	0.15	17	2.04
Macrocystis			2550	35	2.50		57.80
Hunt Point	11/Apr	16/Apr	2270	78	1.01	40	71.09
Bottom				78	1.14	8	16.19
Macrocystis			2270	31	2.50		73.78
Island Point	08/Apr	10/Apr	2160	74	1.00	63	99.62
Bottom				74	0.63	16	16.27

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Macrocystis			2160	22	2.87		35.71
Porcher Island North	06/Apr	10/Apr	6800	15	0.73	62	47.34
Bottom				15	1.50	3	4.77
Macrocystis			1200	18	1.08		5.46
Dive Survey Area Total							4002.13

Statistical Area 05: Grenville-Principe

Surface Survey

Herring Section: 053

Ala Pass	20/Apr	21/Apr	10	5	6.72	60	0.20
Ala Pass	20/Apr	21/Apr	10	3	1.72	65	0.03
Ala Pass	20/Apr	21/Apr	50	1	0.63	100	0.03
Ala Pass	20/Apr	21/Apr	100	5	3.40	100	1.70
Ala Pass	20/Apr	21/Apr	125	2	2.42	100	0.61
Ala Pass	20/Apr	21/Apr	150	2	1.00	35	0.11
Ala Pass	20/Apr	21/Apr	200	3	1.08	90	0.58
Ala Pass	20/Apr	21/Apr	600	3	2.83	95	4.83
Ala Pass	20/Apr	21/Apr	800	2	2.15	95	3.27
Surface Survey Area Total							11.36

Dive Survey

Herring Section: 052

Absalom Island	08/Apr	09/Apr	400	72	0.69	55	10.81

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Bottom				72	0.50	8	1.19
Clamshell Island	10/Apr	11/Apr	70	80	1.47	88	7.21
Dries Inlet	24/Mar	26/Mar	5100	93	1.13	24	127.31
Bottom				93	1.27	14	83.66
Freeman Passage	08/Apr	09/Apr	1840	45	1.31	51	55.15
Bottom				45	0.73	21	12.52
Gurd Island	26/Mar	27/Mar	500	38	1.26	32	7.60
Bottom				38	1.67	30	9.38
Gurd Island	10/Apr	11/Apr	3880	13	1.37	70	47.15
Bottom				13	0.33	26	4.17
Kitkatla Creek	22/Mar	26/Mar	3370	64	1.85	39	154.81
Bottom				64	0.91	22	43.53
Ness Islands	28/Mar	29/Mar	2700	74	0.63	49	61.19
Bottom				74	1.05	21	42.96
Porcher Peninsula	10/Apr	11/Apr	2200	82	1.25	48	107.72
Willis Bay	08/Apr	09/Apr	2280	44	2.04	52	104.96
Bottom				44	0.76	19	14.61
Dive Survey Area Total							895.92

Statistical Area 06: Butedale

Surface Survey

Herring Section: 063							
Clio Bay	04/Apr	07/Apr	183	10	5.00	100	9.15
Clio Bay	04/Apr	07/Apr	366	5	2.00	100	3.66
Clio Bay	04/Apr	07/Apr	549	5	0.20	100	0.55
Clio Bay	04/Apr	07/Apr	915	5	7.00	100	32.03
Clio Bay	09/Apr	12/Apr	366	3	0.20	100	0.22

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	Spawn Date End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Kildala Arm	09/Apr	12/Apr	366	8	1.00	100	2.93
Kildala Arm	09/Apr	12/Apr	366	15	5.00	100	27.45
Kildala Arm	09/Apr	11/Apr	549	10	4.10	90	20.26
Kildala Arm	09/Apr	11/Apr	732	2	5.00	90	6.59
Kitimat	17/Feb	17/Feb	366	3	0.30	80	0.26
Kitimat	24/Feb	25/Feb	183	5	0.30	90	0.25
Kitimat	24/Feb	25/Feb	549	10	1.15	90	5.68
Kitimat	24/Feb	25/Feb	732	30	0.50	90	9.88
Kitimat	04/Apr	07/Apr	1463	20	0.60	100	17.56
Minette Bay	07/Apr	11/Apr	915	2	1.00	70	1.28
Minette Bay	05/Feb	05/Feb	183	5	2.50	50	1.14
Wathlsto Creek	05/Feb	05/Feb	366	5	0.50	50	0.46
Wathlsto Creek	04/Apr	07/Apr	366	5	2.00	100	3.66
Wathlsto Creek	04/Apr	07/Apr	549	40	0.30	100	6.59
	04/Apr	07/Apr	549	50	1.00	100	27.45
Herring Section: 067							
Hastings Island/Lagoon	26/Mar	29/Mar	200	25	1.08	80	4.30
Hastings Island/Lagoon	26/Mar	29/Mar	300	15	3.05	75	10.29
Hastings Island/Lagoon	26/Mar	29/Mar	350	5	1.22	75	1.61
Hastings Island/Lagoon	26/Mar	29/Mar	600	5	1.09	50	1.64
Jamieson Point	27/Mar	27/Mar	200	5	0.75	50	0.38
Price Island	26/Mar	29/Mar	100	100	4.10	50	20.50
Price Island	26/Mar	29/Mar	100	20	1.55	70	2.17
Price Island	26/Mar	29/Mar	150	10	1.32	60	1.19
Price Island	26/Mar	29/Mar	150	5	1.50	20	0.23
Price Island	26/Mar	29/Mar	200	15	3.60	70	7.56
Price Island	26/Mar	29/Mar	200	15	1.30	70	2.73
Price Island	26/Mar	29/Mar	200	8	0.73	80	0.93
Price Island	26/Mar	29/Mar	500	100	5.00	60	150.00
Price Island	26/Mar	29/Mar	700	5	1.30	80	3.64
	26/Mar	29/Mar	3000	4	1.57	80	15.12

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
West Higgins Passage	24/Mar	30/Mar	30	20	2.00	50	0.60
West Higgins Passage	24/Mar	30/Mar	50	5	0.85	50	0.11
West Higgins Passage	24/Mar	30/Mar	50	15	0.50	60	0.23
West Higgins Passage	24/Mar	30/Mar	100	4	1.10	50	0.22
West Higgins Passage	24/Mar	30/Mar	100	25	2.80	70	4.90
West Higgins Passage	24/Mar	30/Mar	100	50	3.00	50	7.50
West Higgins Passage	24/Mar	30/Mar	110	15	3.63	90	5.39
West Higgins Passage	24/Mar	30/Mar	120	10	2.00	80	1.92
West Higgins Passage	24/Mar	30/Mar	150	15	1.44	80	2.60
West Higgins Passage	24/Mar	30/Mar	150	15	2.00	50	2.25
West Higgins Passage	24/Mar	30/Mar	150	10	0.64	30	0.29
West Higgins Passage	24/Mar	30/Mar	150	15	1.85	70	2.91
West Higgins Passage	24/Mar	30/Mar	150	5	1.27	40	0.38
West Higgins Passage	24/Mar	30/Mar	200	6	0.95	60	0.68
West Higgins Passage	24/Mar	30/Mar	200	10	0.95	70	1.33
West Higgins Passage	24/Mar	30/Mar	200	20	1.90	100	7.60
West Higgins Passage	24/Mar	30/Mar	200	8	0.77	50	0.62
West Higgins Passage	24/Mar	30/Mar	200	8	0.76	50	0.61
West Higgins Passage	24/Mar	30/Mar	200	20	1.75	50	3.50
West Higgins Passage	24/Mar	30/Mar	200	12	1.42	65	2.22
West Higgins Passage	24/Mar	30/Mar	220	6	0.74	30	0.29
West Higgins Passage	24/Mar	30/Mar	250	10	1.00	75	1.87
West Higgins Passage	24/Mar	30/Mar	250	10	0.82	40	0.82
West Higgins Passage	24/Mar	30/Mar	250	8	1.53	60	1.84
West Higgins Passage	24/Mar	30/Mar	250	10	1.50	25	0.94
West Higgins Passage	24/Mar	30/Mar	250	6	1.00	40	0.60
West Higgins Passage	24/Mar	30/Mar	300	12	1.00	80	2.88
West Higgins Passage	24/Mar	30/Mar	300	5	0.83	70	0.87
West Higgins Passage	24/Mar	30/Mar	300	10	0.50	40	0.60
West Higgins Passage	24/Mar	30/Mar	350	8	0.78	96	2.08
West Higgins Passage	24/Mar	30/Mar	500	5	0.80	20	0.40
West Higgins Passage	24/Mar	30/Mar	500	10	0.89	50	2.22

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	Spawn Date End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
West Higgins Passage	24/Mar	30/Mar	700	10	1.37	50	4.81
West Higgins Passage	24/Mar	30/Mar	800	20	0.80	30	3.84
West Higgins Passage	24/Mar	30/Mar	800	8	0.65	30	1.25
West Higgins Passage	24/Mar	30/Mar	1000	12	0.98	60	7.02
Surface Survey Area Total							477.51
Dive Survey							
Herring Section: 067							
Abrams Island	25/Mar	27/Mar	1000	58	0.99	43	24.13
Bottom				58	0.87	14	6.85
Marvin Islands	23/Mar	29/Mar	1450	70	0.75	9	7.22
Bottom				70	0.91	32	29.47
Macrocystis			1450	88	3.25		98.26
Osment Inlet	23/Mar	29/Mar	2790	51	0.97	26	35.85
Bottom				51	0.70	24	24.21
Macrocystis			2790	40	3.00		88.50
Parsons Anchorage	23/Mar	27/Mar	3500	42	1.14	41	68.98
Bottom				42	0.92	32	43.53
Macrocystis			3000	34	1.92		57.99
Wilby Point	25/Mar	27/Mar	5500	31	0.86	38	55.20
Bottom				31	0.55	14	13.45
Macrocystis			2000	35	1.17		27.63
Dive Survey Area Total							581.27

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 07: Bella Bella							
Surface Survey							
Herring Section: 072							
Balagny Passage	26/Mar	01/Apr	50	6	1.95	50	0.29
Berry Inlet	30/Mar	01/Apr	70	4	2.75	50	0.39
Berry Inlet	30/Mar	01/Apr	300	5	1.92	70	2.02
Berry Inlet	30/Mar	01/Apr	450	4	3.63	80	5.23
Foote Islets	24/Mar	26/Mar	40	4	3.00	80	0.38
Foote Islets	24/Mar	26/Mar	40	4	2.00	80	0.26
Foote Islets	24/Mar	26/Mar	120	2	3.34	75	0.60
Foote Islets	24/Mar	26/Mar	300	4	2.00	60	1.44
Neekas Inlet	26/Mar	02/Apr	100	300	3.00	75	67.50
Neekas Inlet	26/Mar	02/Apr	200	4	4.40	90	3.17
Neekas Inlet	26/Mar	02/Apr	1200	3	0.68	75	1.82
Neekas Inlet	26/Mar	02/Apr	1400	4	3.50	80	15.68
Neekas Inlet	26/Mar	02/Apr	1800	3	2.40	75	9.72
Neekas Inlet	26/Mar	02/Apr	1850	4	1.00	75	5.55
Neekas Inlet	26/Mar	02/Apr	2150	3	1.40	80	7.22
Shingle Rock	31/Mar	02/Apr	2600	3	2.00	75	11.70
Spiller Channel	31/Mar	02/Apr	150	2	1.63	40	0.20
Spiller Channel	31/Mar	02/Apr	50	2	1.58	70	0.11
Spiller Channel	31/Mar	02/Apr	70	3	1.63	80	0.27
Spiller Channel	31/Mar	02/Apr	100	250	0.50	20	2.50
Spiller Channel	31/Mar	02/Apr	160	2	1.54	45	0.22
Spiller Channel	31/Mar	02/Apr	180	4	1.68	75	0.91
Spiller Channel	31/Mar	02/Apr	250	2	1.62	65	0.53
Spiller Channel	31/Mar	02/Apr	300	3	0.75	100	0.68
Spiller Channel	31/Mar	02/Apr	300	2	2.10	55	0.69
	31/Mar	02/Apr	550	3	0.75	75	0.93

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Spiller Channel	31/Mar	02/Apr	650	3	1.00	80	1.56
Spiller Channel	31/Mar	02/Apr	700	2	0.95	50	0.67
Spiller Channel	31/Mar	02/Apr	915	3	1.95	90	4.82
Spiller Channel	31/Mar	02/Apr	950	3	1.00	80	2.28
Spiller Channel	31/Mar	02/Apr	1065	3	2.00	80	5.11
Spiller Channel	31/Mar	02/Apr	2000	1	0.50	40	0.40
Spiller Channel	31/Mar	02/Apr	2900	4	1.80	80	16.70
Spiller Channel	31/Mar	02/Apr	6700	3	1.50	75	22.61
Herring Section: 074							
Joassa Channel	31/Mar	04/Apr	100	3	1.63	40	0.20
Joassa Channel	31/Mar	04/Apr	130	3	1.40	50	0.27
Joassa Channel	31/Mar	04/Apr	150	2	1.00	20	0.06
Joassa Channel	31/Mar	04/Apr	180	2	1.58	60	0.34
Joassa Channel	31/Mar	04/Apr	200	3	1.58	60	0.57
Herring Section: 076							
Kildidt Sound	01/Apr	04/Apr	2560	3	1.35	70	7.26
Spider Anchorage	01/Apr	03/Apr	30	1	2.50	70	0.03
Spider Anchorage	01/Apr	03/Apr	100	3	2.67	90	0.72
Herring Section: 078							
James Bay	30/Mar	02/Apr	100	3	1.00	80	0.24
James Bay	30/Mar	02/Apr	600	3	1.00	40	0.72
James Bay	30/Mar	02/Apr	1200	3	1.00	50	1.80
Surface Survey Area Total							206.36

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Dive Survey							
Herring Section: 072							
Balagny Passage	29/Mar	01/Apr	1080	33	2.15	42	31.46
Bottom				33	0.87	25	7.49
Berry Inlet	30/Mar	01/Apr	5150	41	1.78	28	105.16
Bottom				41	1.18	36	89.93
Berry Inlet	30/Mar	01/Apr	1150	26	1.81	32	17.54
Bottom				26	1.37	53	21.71
Bush Point	30/Mar	01/Apr	640	53	0.75	8	2.12
Bottom				53	1.40	25	11.87
Fisher Point	30/Mar	01/Apr	1100	70	1.22	4	4.22
Bottom				70	1.76	41	55.50
Ivory Island	29/Mar	01/Apr	780	36	4.25	70	83.54
Bottom				36	1.79	42	20.95
Lambard Inlet	31/Mar	03/Apr	1200	26	1.45	35	16.18
Bottom				26	1.01	32	10.26
Macrocystis			1200	26	1.75		6.65
Moss Passage	24/Mar	28/Mar	1570	57	1.64	29	42.85
Bottom				57	1.16	29	29.84
Macrocystis			700	63	0.80		1.18
Moss Passage	24/Mar	01/Apr	3500	30	1.38	28	41.69
Bottom				30	1.07	43	48.51
Macrocystis			2100	21	2.55		5.37
Moss Passage	24/Mar	01/Apr	3500	58	1.42	23	65.84
Bottom				58	1.12	32	73.46
Macrocystis			2100	12	4.77		3.63
Port Blackney	31/Mar	03/Apr	1180	81	1.29	42	51.69
Bottom				81	0.97	39	35.68
Port Blackney	31/Mar	03/Apr	710	42	0.68	25	5.00
Bottom				42	0.58	31	5.32

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Powell Anchorage	29/Mar	01/Apr	2390	42	2.50	52	131.05
Bottom				42	1.17	29	34.47
Macrocystis			600	2	0.75		0.57
Powell Anchorage	29/Mar	01/Apr	2850	26	2.21	41	66.85
Bottom				26	1.17	35	30.12
Reid Passage	31/Mar	03/Apr	1650	29	1.42	46	31.29
Bottom				29	0.49	27	6.42
Reid Passage	31/Mar	03/Apr	1800	22	2.20	68	59.27
Bottom				22	1.37	26	14.15
Watch Island	29/Mar	01/Apr	4390	72	3.77	31	368.57
Bottom				72	1.38	22	97.47
Herring Section: 074							
Little Thompson Bay	29/Mar	04/Apr	4030	30	1.79	34	74.31
Bottom				30	1.97	36	85.70
Princess Alice Island	27/Mar	02/Apr	1400	46	3.06	39	77.67
Bottom				46	0.53	5	1.71
Stryker Bay	15/Apr	18/Apr	1100	11	2.25	52	13.62
Bottom				11	1.02	55	6.58
Waskesiu Pass	31/Mar	02/Apr	360	16	2.33	22	2.88
Bottom				16	0.82	42	1.92
Macrocystis			90	10	1.50		0.22
Herring Section: 077							
East Higgins Pass	31/Mar	02/Apr	10240	42	1.16	41	206.27
Bottom				42	0.99	30	127.46
Macrocystis			750	20	1.36		3.22
Dive Survey Area Total							2336.43

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 08: Bella Coola							
Surface Survey							
Herring Section: 083							
North Bentinck Arm	13/Mar	13/Mar	275	3	0.50	60	0.25
North Bentinck Arm	13/Mar	13/Mar	1200	2	0.50	40	0.48
North Bentinck Arm	13/Mar	13/Mar	1200	2	0.95	40	0.91
North Bentinck Arm	13/Mar	13/Mar	1400	2	0.50	30	0.42
North Bentinck Arm	13/Mar	13/Mar	4200	2	0.48	50	2.02
South Bentinck Arm	13/Mar	13/Mar	475	10	0.30	50	0.71
Herring Section: 084							
Burke Channel	27/May	30/May	8000	2	4.25	50	34.00
Herring Section: 085							
Illahie Inlet	31/Mar	03/Apr	9600	4	3.40	90	117.50
Kwakume Inlet	26/Mar	31/Mar	350	50	4.58	85	68.05
Kwakume Inlet	26/Mar	31/Mar	750	2	2.07	90	2.80
Kwakume Inlet	26/Mar	31/Mar	2500	4	4.10	90	36.90
Kwakume Point	25/Mar	30/Mar	450	3	1.65	85	1.89
Kwakume Point	25/Mar	30/Mar	4206	4	2.35	90	35.58
Pruth Bay	27/Mar	27/Mar	250	50	0.50	90	5.62
Pruth Bay	27/Mar	27/Mar	900	2	0.34	85	0.52
Herring Section: 086							
Namu	24/Mar	27/Mar	450	70	3.16	90	89.59
Namu	24/Mar	27/Mar	450	3	2.70	90	3.28
Namu	24/Mar	27/Mar	1300	3	3.30	85	10.94
Surface Survey Area Total							411.47

Table 13 (cont'd) HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 09: Rivers Inlet							
Surface Survey							
Herring Section: 093							
Kilbella Bay	12/Mar	14/Mar	150	20	0.83	25	0.62
Kilbella Bay	12/Mar	14/Mar	300	15	1.40	80	5.04
Kilbella Bay	12/Mar	14/Mar	400	5	1.25	80	2.00
Kilbella Bay	12/Mar	14/Mar	650	50	0.50	30	4.87
Kilbella Bay	12/Mar	14/Mar	3300	5	1.00	80	13.20
Rivers Inlet-Head	12/Mar	14/Mar	50	5	4.00	100	1.00
Rivers Inlet-Head	12/Mar	14/Mar	100	100	0.75	40	3.00
Rivers Inlet-Head	12/Mar	14/Mar	300	20	0.67	75	3.04
Rivers Inlet-Head	12/Mar	14/Mar	300	300	2.00	80	144.00
Rivers Inlet-Head	12/Mar	14/Mar	500	5	1.20	100	3.00
Rivers Inlet-Head	12/Mar	14/Mar	600	100	0.50	50	15.00
Rivers Inlet-Head	12/Mar	14/Mar	1500	8	2.40	80	23.04
Rivers Inlet-Head	12/Mar	14/Mar	1800	100	1.35	80	194.40
Rivers Inlet-Head	12/Mar	14/Mar	2000	5	2.00	100	20.00
Rivers Inlet-Head	12/Mar	14/Mar	3100	5	1.00	80	12.40
Shotbolt Bay	12/Mar	14/Mar	1500	5	1.00	90	6.75
Surface Survey Area Total							451.36
Statistical Area 10: Smith Inlet							
Surface Survey							
Herring Section: 102							
Anchor Bight	04/Apr	04/Apr	549	18	2.00	60	11.86

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Bull Cove	07/Apr	07/Apr	200	3	2.00	50	0.60
Crabpot Point	09/Apr	09/Apr	2469	9	3.50	50	38.89
Indian Island	07/Apr	07/Apr	1280	7	4.50	100	40.32
Indian Island	07/Apr	07/Apr	1372	5	1.50	83	8.54
Indian Island	07/Apr	07/Apr	1463	5	2.50	97	17.74
Surface Survey Area Total							117.94

Statistical Area 12: Alert Bay

Surface Survey

Herring Section: 122							
Fort Rupert (Beaver Hr.)	10/Apr	13/Apr	450	80	0.20	20	1.44
Fort Rupert (Beaver Hr.)	10/Apr	13/Apr	750	100	0.20	20	3.00
Herring Section: 126							
Kingcome Inlet	17/Mar	17/Mar	232	1	1.00	90	0.21
Kingcome Inlet	17/Mar	17/Mar	350	1	0.79	35	0.10
Kingcome Inlet	17/Mar	17/Mar	370	1	0.50	40	0.07
Kingcome Inlet	17/Mar	17/Mar	463	3	1.72	95	2.28
Kingcome Inlet	17/Mar	17/Mar	510	3	2.77	95	4.03
Kingcome Inlet	17/Mar	17/Mar	556	3	1.90	100	3.17
Kingcome Inlet	17/Mar	17/Mar	649	3	2.05	85	3.39
Kingcome Inlet	17/Mar	17/Mar	649	2	1.95	90	2.28
Kingcome Inlet	17/Mar	17/Mar	649	3	1.40	80	2.18
Kingcome Inlet	17/Mar	17/Mar	649	2	1.80	70	1.64
Kingcome Inlet	17/Mar	17/Mar	695	2	1.10	80	1.22
Kingcome Inlet	17/Mar	17/Mar	741	3	1.35	90	2.70
Kingcome Inlet	17/Mar	17/Mar	1150	4	1.42	95	6.23

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Kingcome Inlet	18/Mar	18/Mar	200	2	0.50	80	0.16
Kingcome Inlet	18/Mar	18/Mar	1177	2	1.37	80	2.59
Kingcome Inlet	20/Mar	20/Mar	649	2	0.80	20	0.21
Kingcome Inlet	20/Mar	20/Mar	834	3	1.68	70	2.95
Kingcome Inlet	20/Mar	20/Mar	973	2	3.12	95	5.78
Kingcome Inlet	26/Mar	26/Mar	279	3	1.45	90	1.09
Kingcome Inlet	26/Mar	26/Mar	695	2	0.85	75	0.89
Kingcome Inlet	26/Mar	26/Mar	1065	2	0.68	90	1.29
Kingcome Inlet	29/Mar	29/Mar	450	3	0.80	90	0.97
Kingcome Inlet	29/Mar	29/Mar	556	3	1.71	80	2.28
Kingcome Inlet	29/Mar	29/Mar	1300	2	1.72	75	3.36
Wakeman Sound	14/Mar	15/Mar	370	4	1.60	90	2.14
Wakeman Sound	14/Mar	15/Mar	463	3	1.30	90	1.63
Wakeman Sound	14/Mar	15/Mar	463	3	2.60	95	3.43
Wakeman Sound	14/Mar	15/Mar	469	4	1.45	95	2.58
Wakeman Sound	14/Mar	15/Mar	510	4	1.20	90	2.20
Wakeman Sound	14/Mar	15/Mar	556	3	1.25	40	0.83
Wakeman Sound	14/Mar	15/Mar	556	2	1.76	95	1.86
Wakeman Sound	14/Mar	15/Mar	649	2	0.46	50	0.30
Wakeman Sound	14/Mar	15/Mar	649	2	0.86	90	1.00
Wakeman Sound	14/Mar	15/Mar	741	4	0.90	70	1.86
Wakeman Sound	14/Mar	15/Mar	834	2	0.77	60	0.77
Wakeman Sound	14/Mar	15/Mar	834	3	1.21	90	2.72
Wakeman Sound	14/Mar	15/Mar	927	2	2.80	90	4.67
Wakeman Sound	14/Mar	15/Mar	1204	5	1.85	90	10.02
Wakeman Sound	14/Mar	15/Mar	1204	2	1.27	45	1.38
Wakeman Sound	14/Mar	15/Mar	1298	2	1.95	95	4.81
Wakeman Sound	14/Mar	15/Mar	1575	2	0.50	15	0.24
Wakeman Sound	14/Mar	15/Mar	2408	10	0.70	20	3.35
Herring Section: 127							
Ahnuhati Point	28/Mar	30/Mar	27	2	1.00	80	0.03

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	Spawn Date End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Ahnuhati Point	28/Mar	30/Mar	61	4	2.50	90	0.55
Ahnuhati Point	05/Apr	05/Apr	85	1	0.50	80	0.03
Deer Bay	22/Mar	25/Mar	85	3	2.90	90	0.67
Deer Bay	22/Mar	25/Mar	114	10	1.50	85	1.45
Deer Bay	22/Mar	25/Mar	145	4	1.95	90	1.02
Deer Bay	22/Mar	25/Mar	250	1	0.50	75	0.09
Deer Bay	22/Mar	25/Mar	275	1	1.00	80	0.22
Deer Bay	22/Mar	25/Mar	400	3	1.95	80	1.87
Glacier Bay +	05/Apr	06/Apr	25	1	0.30	70	0.24
Glacier Bay +	05/Apr	06/Apr	40	3	0.50	70	0.01
Glacier Bay +	05/Apr	06/Apr	50	6	1.50	65	0.04
Glacier Bay +	05/Apr	06/Apr	60	3	1.90	90	0.41
Glacier Bay +	05/Apr	06/Apr	70	7	1.00	90	0.31
Glacier Bay +	05/Apr	06/Apr	125	2	0.50	90	0.44
Glacier Bay +	05/Apr	06/Apr	230	10	0.30	80	0.10
Glacier Bay +	05/Apr	06/Apr	270	2	2.50	50	0.34
Glacier Bay +	05/Apr	06/Apr	310	3	0.30	80	1.08
Glacier Bay +	05/Apr	06/Apr	310	1	1.00	85	0.24
Glacier Bay +	05/Apr	06/Apr	575	1	0.30	85	0.26
Knight Inlet	21/Mar	22/Mar	260	13	2.00	75	0.13
Knight Inlet	22/Mar	24/Mar	180	3	2.80	85	5.75
Knight Inlet	22/Mar	24/Mar	200	1	0.50	90	1.36
Knight Inlet	22/Mar	24/Mar	230	3	2.35	85	0.09
Knight Inlet	22/Mar	24/Mar	300	3	2.42	85	1.38
Knight Inlet	22/Mar	24/Mar	325	3	2.80	80	1.75
Knight Inlet	22/Mar	24/Mar	600	1	0.50	90	2.46
Knight Inlet	30/Mar	31/Mar	30	4	1.00	70	0.21
Knight Inlet	30/Mar	31/Mar	230	12	1.50	80	0.10
Knight Inlet (Head)	17/Mar	20/Mar	60	2	1.00	85	3.52
Knight Inlet (Head)	17/Mar	20/Mar	75	2	1.50	85	0.10
Knight Inlet (Head)	17/Mar	20/Mar	175	1	1.50	75	0.17
						85	0.22

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Knight Inlet (Head)	19/Mar	22/Mar	118	5	2.50	90	1.33
Knight Inlet (Head)	19/Mar	22/Mar	185	10	1.45	80	2.15
Knight Inlet (Head)	19/Mar	22/Mar	500	2	2.90	80	2.32
Knight Inlet (Head)	19/Mar	22/Mar	570	2	1.50	75	1.28
Knight Inlet (Head)	19/Mar	22/Mar	730	2	2.00	80	2.34
Wahkash Creek	17/Mar	20/Mar	30	2	1.50	90	0.08
Wahkash Creek	17/Mar	20/Mar	40	3	1.50	90	0.16
Wahkash Creek	17/Mar	20/Mar	210	5	1.95	90	1.84
Wahshihlas Bay	22/Mar	24/Mar	125	3	1.00	80	0.30
Wahshihlas Bay	22/Mar	24/Mar	226	5	2.42	85	2.33
Wahshihlas Bay	22/Mar	24/Mar	275	4	2.80	90	2.77
Wahshihlas Bay	22/Mar	24/Mar	473	4	3.37	85	5.43
Wahshihlas Bay	22/Mar	24/Mar	550	10	2.80	90	13.86
Wahshihlas Bay	22/Mar	24/Mar	630	4	2.00	80	4.03
Wahshihlas Bay	22/Mar	24/Mar	656	6	4.20	80	13.22
Surface Survey Area Total							181.38
Statistical Area 13: Quathiaski							
Surface Survey							
Herring Section 132							
Deepwater Bay	21/Mar	21/Mar	30	3	0.50	40	0.02
Deepwater Bay	21/Mar	21/Mar	60	5	0.50	20	0.03
Herring Section 133							
Loughborough Inlet	06/Apr	06/Apr	50	1	1.00	90	0.04
Loughborough Inlet	06/Apr	06/Apr	250	2	0.50	70	0.17

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Herring Section 134							
Bear Bay	23/Mar	23/Mar	7000	2	5.00	65	45.50
Bear Bay	23/Mar	23/Mar	7000	2	5.00	65	45.50
Orford Bay	24/Mar	24/Mar	400	6	2.00	60	2.88
Waddington Harbour	23/Mar	23/Mar	2000	3	0.50	70	2.10
Waddington Harbour	24/Mar	24/Mar	500	2	1.00	60	0.60
Waddington Harbour	24/Mar	24/Mar	500	2	1.00	60	0.60
Waddington Harbour	24/Mar	24/Mar	500	2	1.00	60	0.60
Waddington Harbour	24/Mar	24/Mar	1000	2	2.00	50	1.00
Waddington Harbour	24/Mar	24/Mar	2000	6	0.50	80	4.80
Waddington Harbour	24/Mar	24/Mar	5000	2	1.00	60	6.00
Surface Survey Area Total							110.45
Statistical Area 14: Comox							
Dive Survey							
Herring Section 142							
Boyle Point	11/Mar	21/Mar	7150	50	1.13	52	208.17
Bottom				50	0.92	20	64.63
Cape Lazo	11/Mar	21/Mar	8330	308	1.82	45	2099.74
Bottom				308	1.28	24	800.60
Fillongley Park	11/Mar	21/Mar	10450	125	0.92	43	511.70
Bottom				125	1.37	18	317.69
Henry Bay	11/Mar	21/Mar	3330	98	4.57	47	709.29
Bottom				98	1.85	9	56.60
Komas Bluff	11/Mar	21/Mar	7800	422	1.06	20	686.57
Bottom				422	2.02	12	781.92

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	Spawn Date End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Norman Point	11/Mar	21/Mar	6600	96	2.78	47	825.52
Bottom				96	1.60	24	240.18
Phipps Point	11/Mar	21/Mar	7000	187	2.12	41	1124.13
Bottom				187	1.75	1	20.60
Tralee Point	11/Mar	21/Mar	5900	84	1.88	51	478.93
Bottom				84	1.28	22	137.55
Tribune Bay	11/Mar	21/Mar	5700	76	2.36	54	554.15
Bottom				76	1.73	17	127.12
Whaling Station Bay	11/Mar	21/Mar	5600	60	2.94	71	700.29
Bottom				60	1.54	31	162.52
Dive Survey Area Total							10607.89

Statistical Area 17: Nanaimo

Dive Survey

Herring Section 173							
Coffin Point (Is.)	27/Mar	31/Mar	4780	91	2.37	34	347.24
Bottom				91	1.98	13	111.11
Kulleet Bay	27/Mar	31/Mar	4950	54	1.19	37	117.19
Bottom				54	0.45	5	5.94
Yellow Point	27/Mar	31/Mar	3800	22	2.39	52	100.71
Bottom				22	6.00	8	37.71
Yellow Pt. (North)	27/Mar	31/Mar	3800	33	3.29	32	133.80
Bottom				33	2.10	22	57.96
Dive Survey Area Total							911.66

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	Spawn Date End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 18: Cowichan							
Surface Survey							
Herring Section: 181							
Ganges Harbour	04/Apr	04/Apr	2750	75	4.00	50	412.50
Surface Survey Area Total							412.50
Statistical Area 19: Saanich Peninsula							
Surface Survey							
Herring Section: 193							
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.27	100	2.65
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.80	100	8.00
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.10	100	1.00
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.80	100	8.00
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.20	100	2.00
Esquimalt Harbour	21/Mar	21/Mar	200	50	1.00	100	10.00
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.40	60	2.40
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.15	100	1.50
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.99	100	9.91
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.77	100	7.70
Esquimalt Harbour	21/Mar	21/Mar	200	50	0.20	100	1.95
Surface Survey Area Total							55.11

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 23: Barkley Sound							
Dive Survey							
Herring Section: 232							
David Island	20/Mar	23/Mar	950	233	2.88	17	105.46
Bottom				233	2.06	26	119.82
Forbes Island	20/Mar	23/Mar	1275	69	2.36	37	76.24
Bottom				69	0.97	22	18.48
Larkin Island	20/Mar	23/Mar	600	105	0.88	13	7.34
Bottom				105	1.90	17	20.09
Macrocystis			600	28	1.75		10.09
Macoah Passage	20/Mar	23/Mar	2900	116	3.55	48	579.65
Bottom				116	1.79	23	136.84
Macoah Passage	20/Mar	23/Mar	700	18	3.28	58	23.75
Bottom				18	1.67	66	13.83
Newcombe Channel	20/Mar	23/Mar	7200	366	2.75	36	2604.62
Bottom				366	1.46	33	1262.90
Macrocystis			400	16	0.26		0.77
Ottaway Islet	20/Mar	23/Mar	900	147	2.41	13	40.91
Bottom				147	1.89	21	53.15
Rowlands Islet	20/Mar	23/Mar	900	67	2.11	22	28.21
Bottom				67	1.69	21	21.66
St Ines Island	20/Mar	23/Mar	1000	9	0.69	70	4.30
Bottom				9	0.50	1	0.06
Stopper Islands	20/Mar	23/Mar	1900	131	0.73	8	14.90
Bottom				131	0.73	5	9.10
Macrocystis			1900	107	0.83		40.63
Ucluelet	20/Mar	23/Mar	2800	65	2.59	32	149.43
Bottom				65	1.58	17	48.85

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Macrocystis			600	39	2.83		6.68
Dive Survey Area Total							5397.77
Statistical Area 24: Clayoquot Sound							
Surface Survey							
Herring Section: 242							
Antons Spit	02/Mar	02/Mar	125	30	1.00	100	3.75
Antons Spit	02/Mar	02/Mar	150	70	1.00	100	10.50
Antons Spit	02/Mar	02/Mar	200	50	2.00	70	14.00
Antons Spit	02/Mar	02/Mar	250	80	1.90	100	38.00
Antons Spit	02/Mar	02/Mar	350	25	0.50	100	4.37
Antons Spit	02/Mar	02/Mar	500	200	1.50	85	127.50
Antons Spit	02/Mar	02/Mar	550	200	1.90	100	209.00
Antons Spit	02/Mar	02/Mar	750	200	0.60	100	90.75
Hesquiat Harbour Head	02/Mar	02/Mar	400	12	0.30	100	1.44
Hesquiat Peninsula	02/Mar	02/Mar	500	120	2.00	100	120.00
Hesquiat Peninsula	02/Mar	02/Mar	700	120	1.00	100	84.00
Roundeault Point	02/Mar	02/Mar	550	50	0.30	100	8.25
Herring Section: 244							
Chetarpe Reserve	25/Mar	25/Mar	25	15	4.00	100	1.50
Herring Section: 245							
Catface Range	25/Mar	25/Mar	10	10	3.00	100	0.30
Catface Range	25/Mar	25/Mar	25	2	3.50	100	0.17
Catface Range	25/Mar	25/Mar	30	2	2.00	100	0.12
Catface Range	25/Mar	25/Mar	40	4	3.00	100	0.48

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Catface Range	25/Mar	25/Mar	50	1	4.00	100	0.20
Catface Range	25/Mar	25/Mar	50	2	4.00	100	0.40
Catface Range	25/Mar	25/Mar	150	1	4.00	100	0.60
Catface Range	25/Mar	25/Mar	150	2	4.00	100	1.20
Catface Range	25/Mar	25/Mar	350	3	2.00	100	2.10
Epper Pass	24/Mar	24/Mar	15	10	2.00	100	0.30
Epper Pass	24/Mar	24/Mar	15	6	4.00	100	0.36
Epper Pass	24/Mar	24/Mar	20	2	3.70	100	0.15
Epper Pass	24/Mar	24/Mar	20	4	3.00	100	0.24
Epper Pass	24/Mar	24/Mar	20	2	4.00	100	0.16
Epper Pass	24/Mar	24/Mar	25	4	3.70	100	0.37
Epper Pass	24/Mar	24/Mar	30	15	3.00	100	1.35
Epper Pass	24/Mar	24/Mar	30	2	4.00	100	0.24
Epper Pass	24/Mar	24/Mar	35	15	3.00	100	1.57
Epper Pass	24/Mar	24/Mar	40	2	2.00	100	0.16
Epper Pass	24/Mar	24/Mar	70	20	2.00	100	2.80
Epper Pass	24/Mar	24/Mar	80	50	3.00	100	12.00
Epper Pass	24/Mar	24/Mar	80	40	3.00	100	9.60
Epper Pass	24/Mar	24/Mar	80	10	3.00	100	2.40
Epper Pass	24/Mar	24/Mar	200	70	3.00	100	42.00
Kakawis	29/Mar	30/Mar	250	70	4.00	100	70.00
Surface Survey Area Total							863.10
Dive Survey							
Herring Section: 245 Elbow Bank	25/Mar	25/Mar	2325	553	0.78	40	406.03

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	Spawn Date End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Rassier Point	25/Mar	25/Mar	800	103	0.22	25	4.53
Dive Survey Area Total							410.56
Statistical Area 25: Nootka Sound							
Dive Survey							
Herring Section: 252							
Friendly Cove	18/Mar	19/Mar	600	77	1.57	37	26.79
Bottom				77	2.19	17	17.05
McKay Passage	18/Mar	19/Mar	3200	26	3.06	20	50.48
Bottom				26	1.69	22	30.98
Macrocystis			1700	14	1.75		4.18
Saavedra Islands	18/Mar	19/Mar	3800	27	3.07	23	72.58
Bottom				27	2.10	44	93.36
Macrocystis			300	15	2.00		0.18
Herring Section: 253							
Outer Nuchatlitz	06/Mar	08/Mar	2100	300	1.52	28	269.96
Bottom				300	0.71	17	74.40
Macrocystis			250	60	0.20		0.95
Dive Survey Area Total							640.91

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Statistical Area 27: Quatsino Sound							
Surface Survey							
Herring Section: 273							
Browning Inlet	15/Mar	16/Mar	500	5	2.33	90	5.23
Forward Inlet	17/Mar	19/Mar	920	15	4.70	90	58.37
Forward Inlet	17/Mar	20/Mar	1350	130	1.68	35	103.19
Greenwood Point	17/Mar	20/Mar	825	30	2.17	50	26.92
Hazard Point	17/Mar	19/Mar	380	10	2.20	40	3.34
Hazard Point	17/Mar	19/Mar	700	100	1.80	40	50.40
Mathews Island	14/Mar	19/Mar	1700	20	4.60	90	140.76
North Harbour	15/Mar	16/Mar	200	5	2.00	100	2.00
North Harbour	15/Mar	16/Mar	650	15	5.00	100	48.75
North Harbour	15/Mar	16/Mar	790	5	1.85	60	4.38
North Harbour	15/Mar	16/Mar	1350	20	4.80	90	116.64
Surface Survey Area Total							559.99
Dive Survey							
Herring Section: 272							
Klaskish Anchorage	16/Mar	18/Mar	2000	118	3.55	21	173.35
Bottom				118	1.86	13	56.42
Klaskish Inlet S. Shore	16/Mar	18/Mar	900	10	1.45	27	3.52
Bottom				10	1.67	15	2.25
McDougal Island	16/Mar	18/Mar	950	83	2.98	47	110.90
Bottom				83	1.94	27	41.32

Table 13 (cont'd)

HERRING SPAWN SUMMARY TABLE: 1991
Spawn Area Index

Spawning Ground	Spawn Date Start	End	Length (m)	Width (m)	Layers	Cover %	S.A.I.
Macrocystis			50	20	3.00		1.93
Dive Survey Area Total							389.70

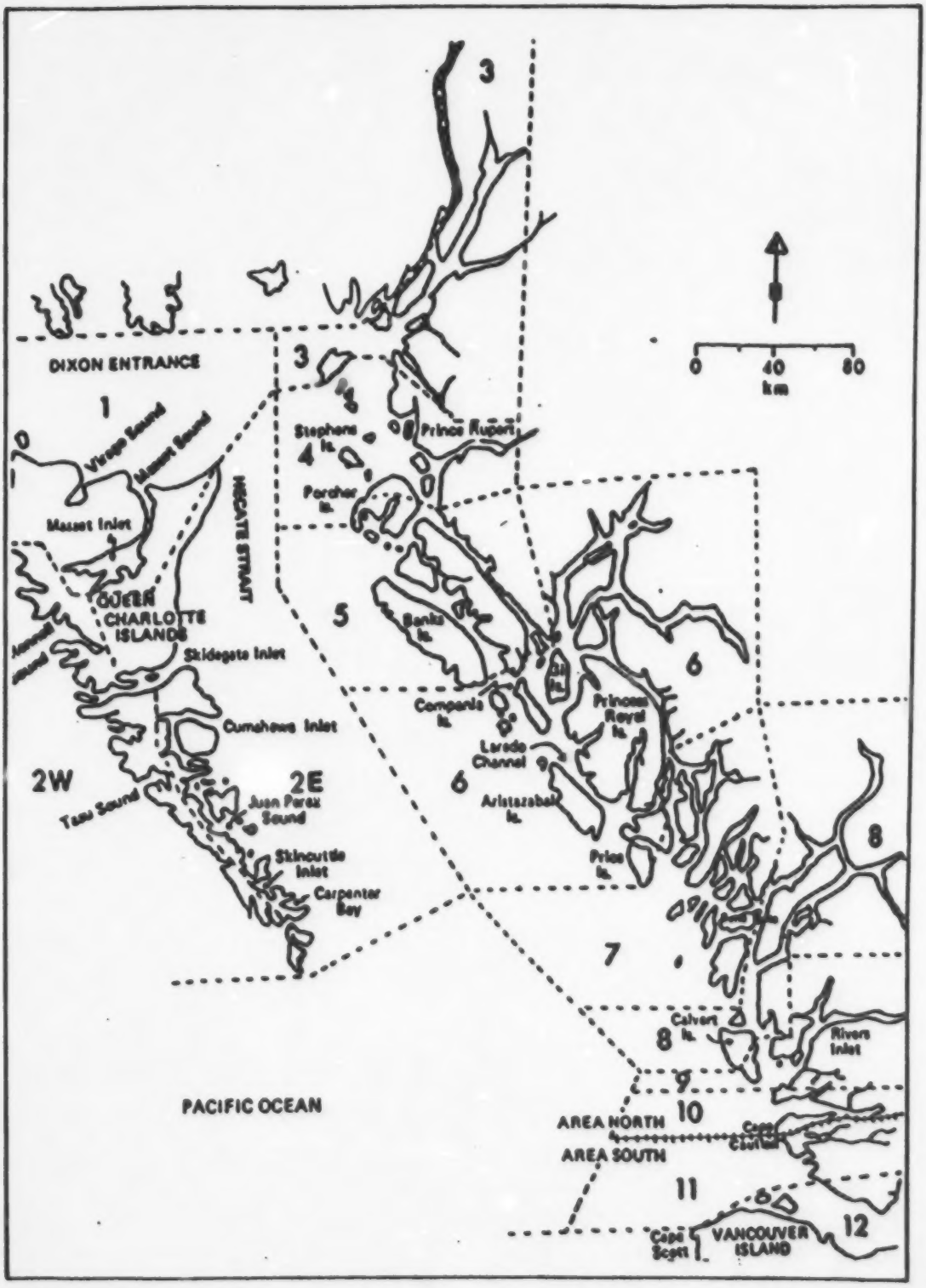

Fig. 1 Location of Stastical Areas in northern B.C.

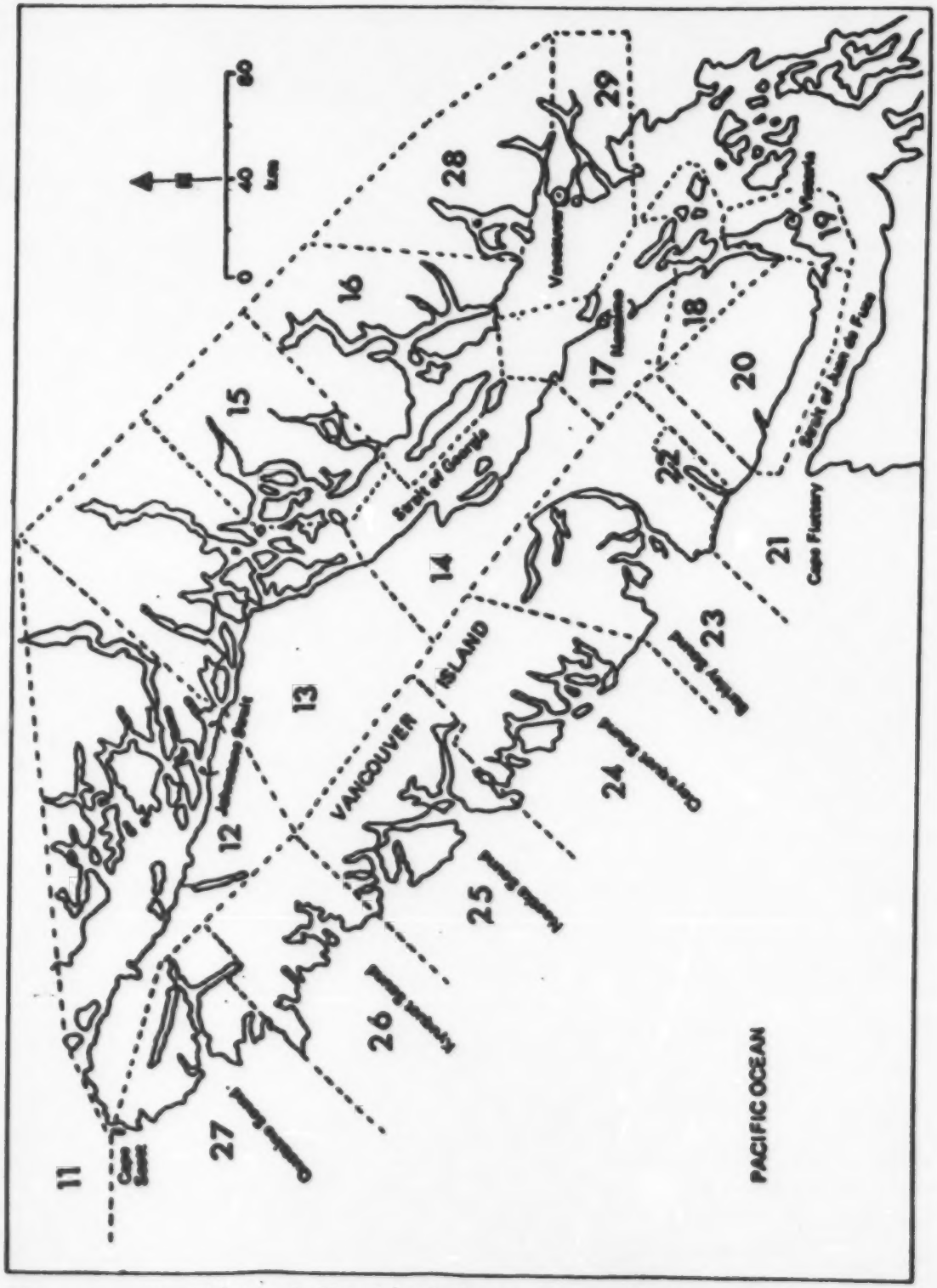

Fig. 2 Location of Stastical Areas in southern B.C.

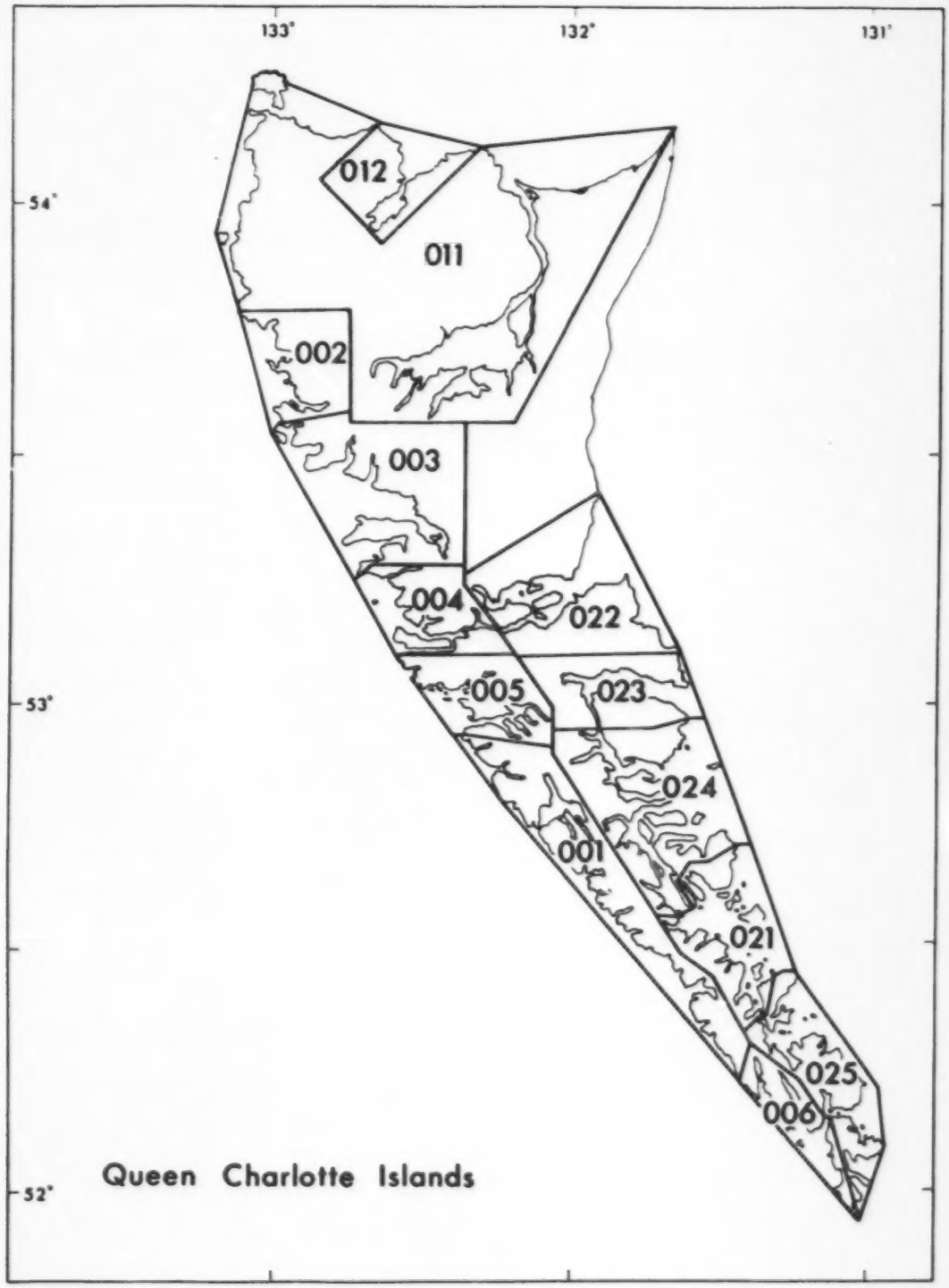

Fig. 3 Herring Sections Queen Charlotte Islands

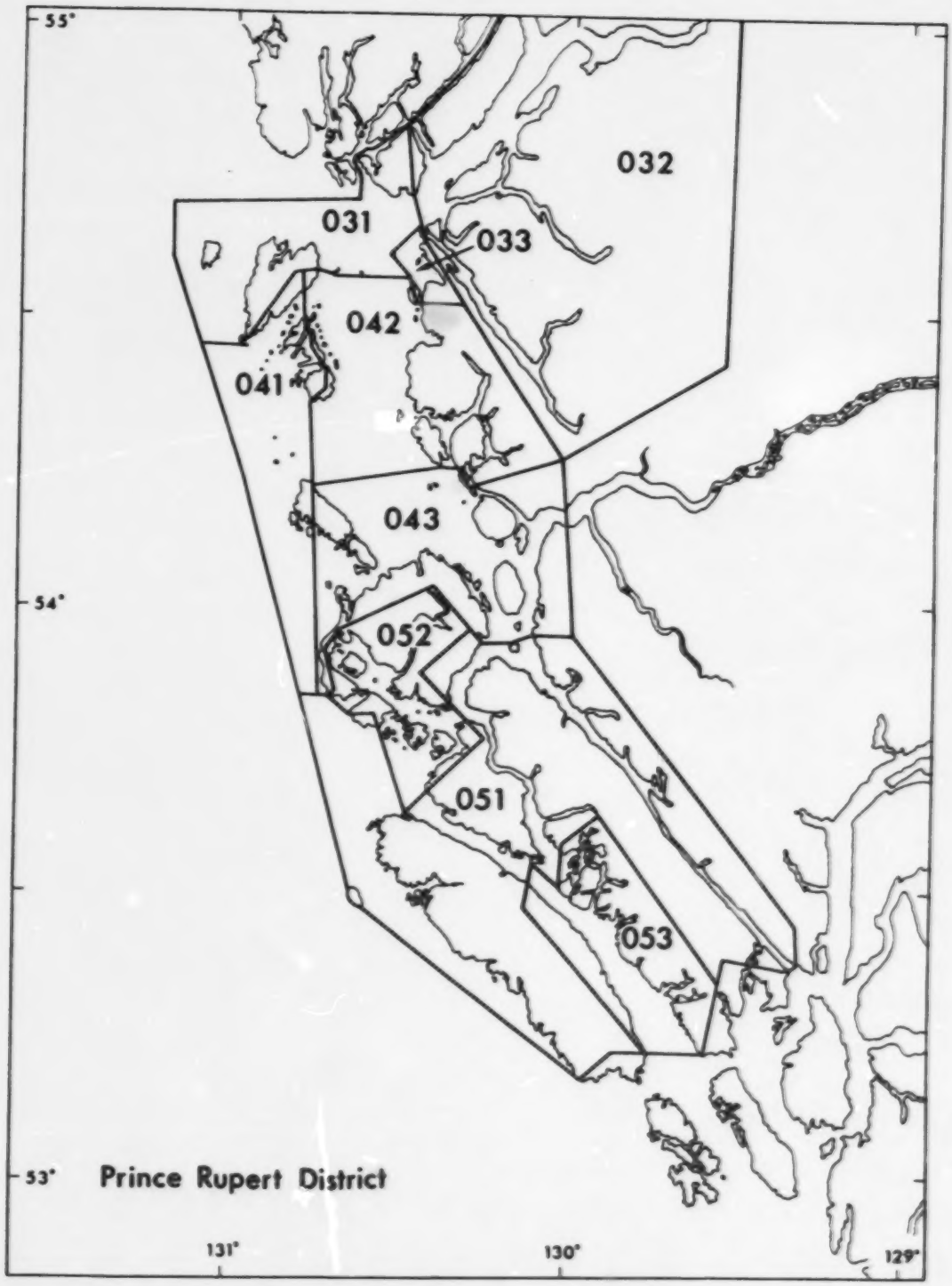

Fig. 4 Herring Sections Prince Rupert

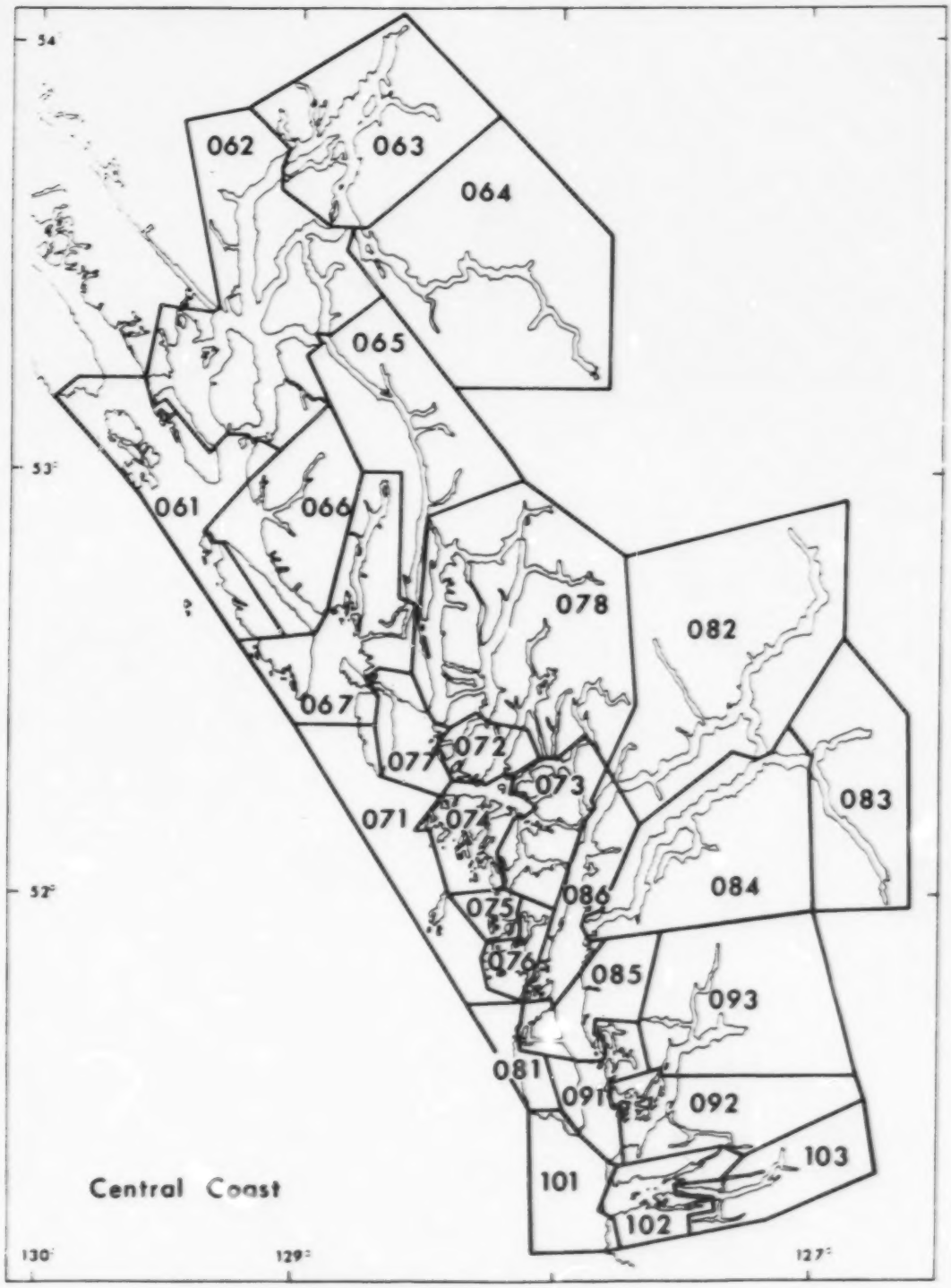

Fig. 5 Herring Sections Central Coast

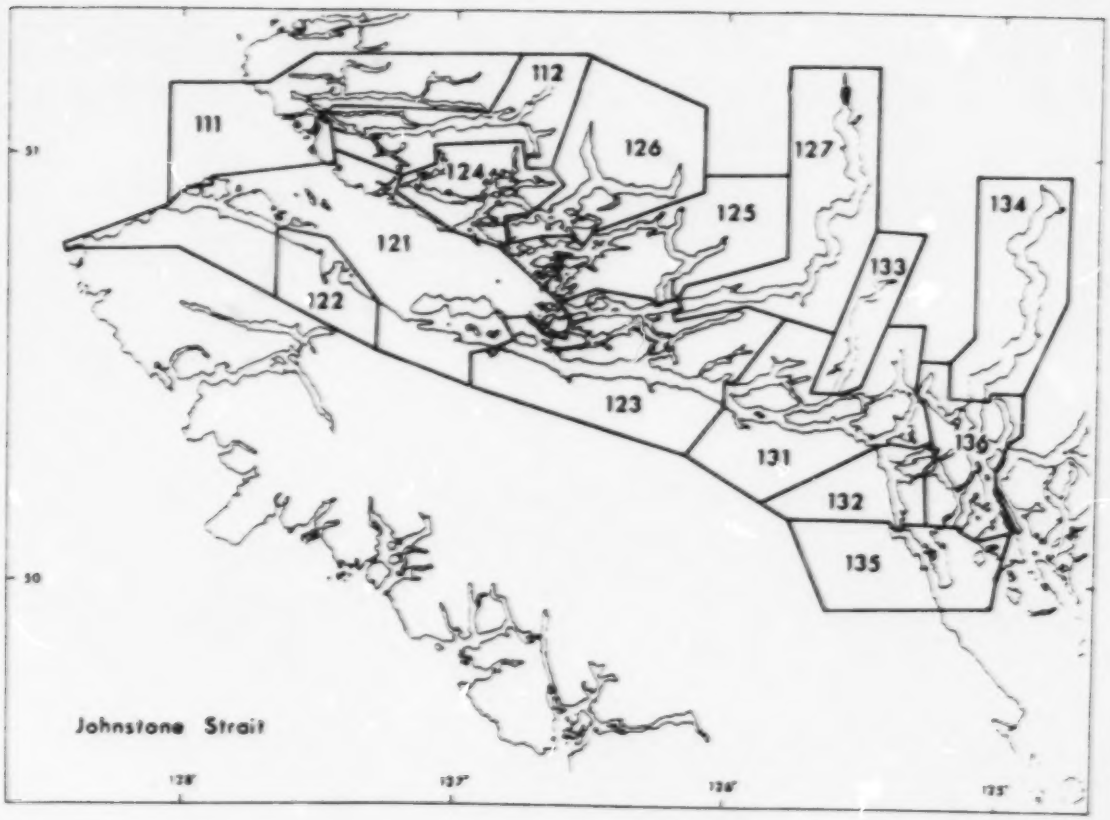

Fig. 6 Herring Sections Johnstone Straits

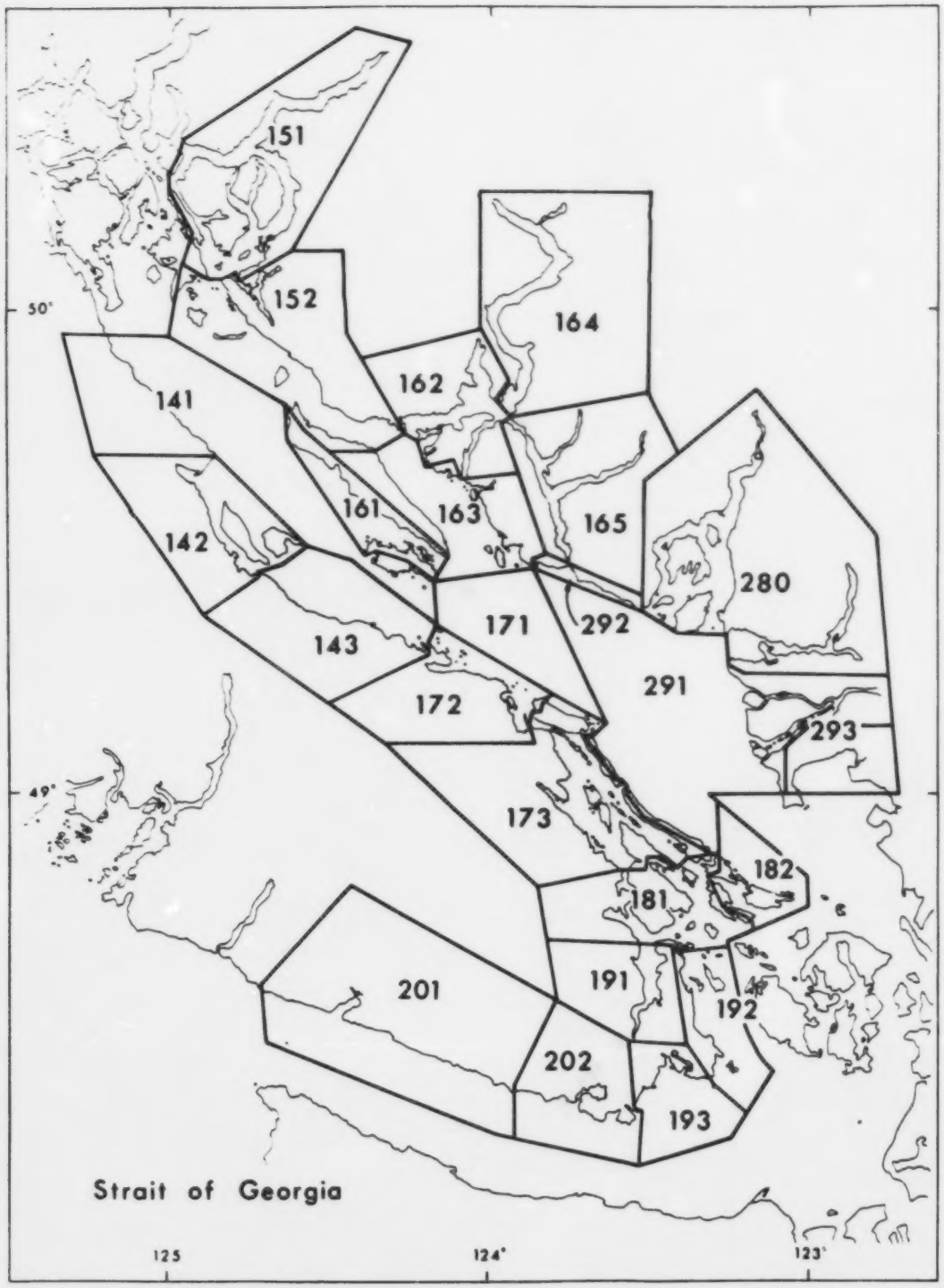

Fig. 7 Herring Sections Strait of Georgia

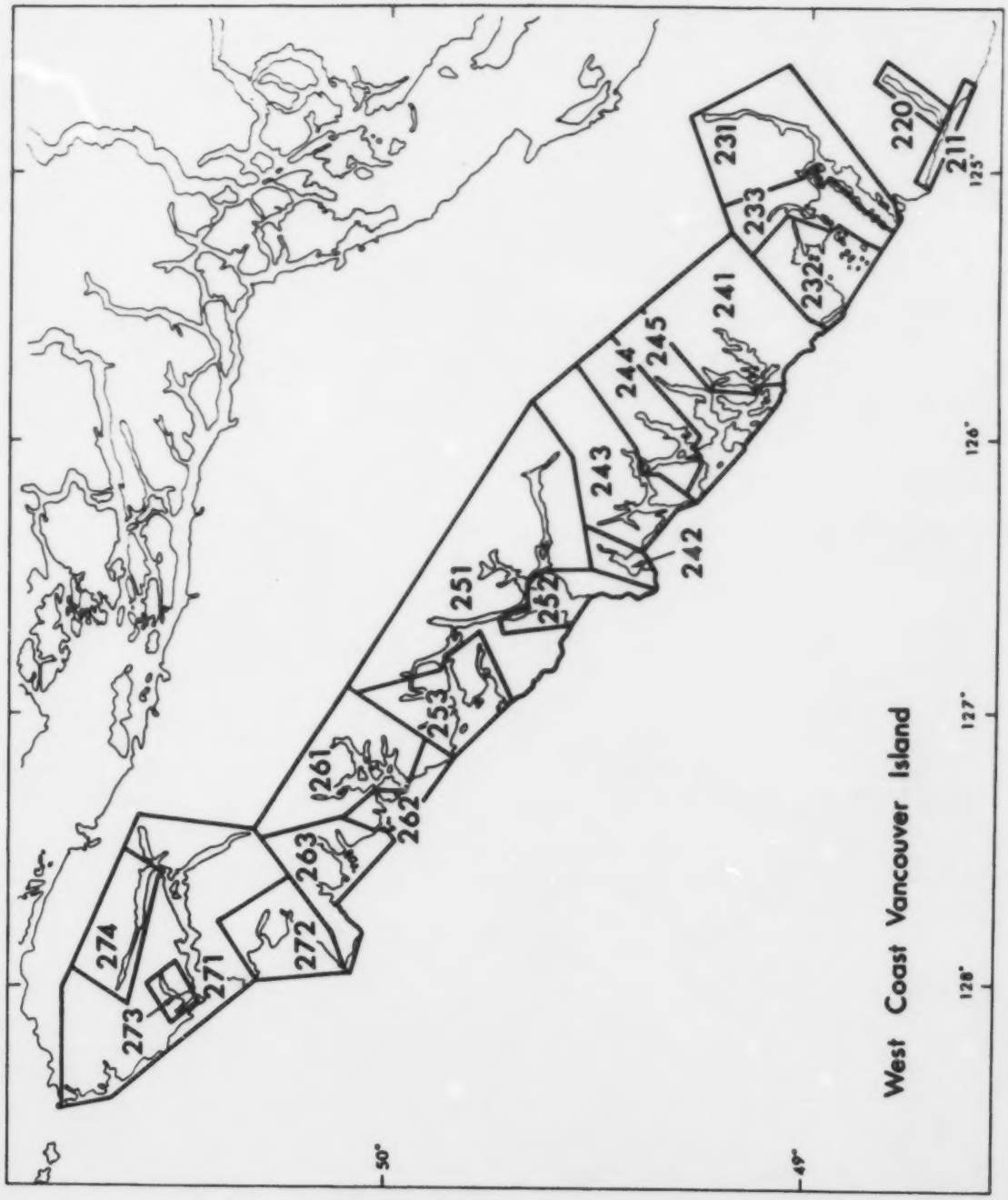

Fig. 8 Herring Sections West Coast Vancouver Island

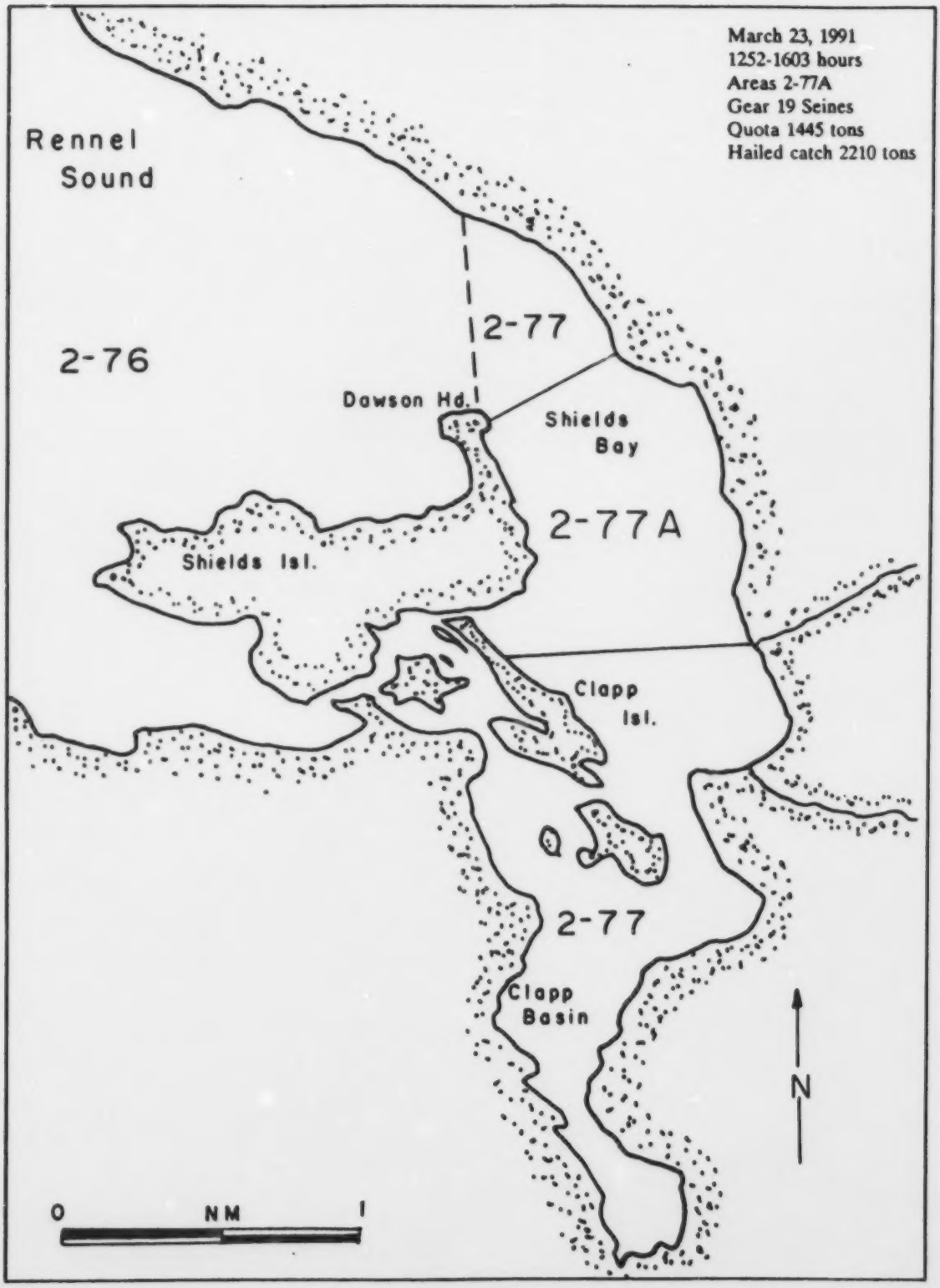

Fig. 9 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 2W, 1991

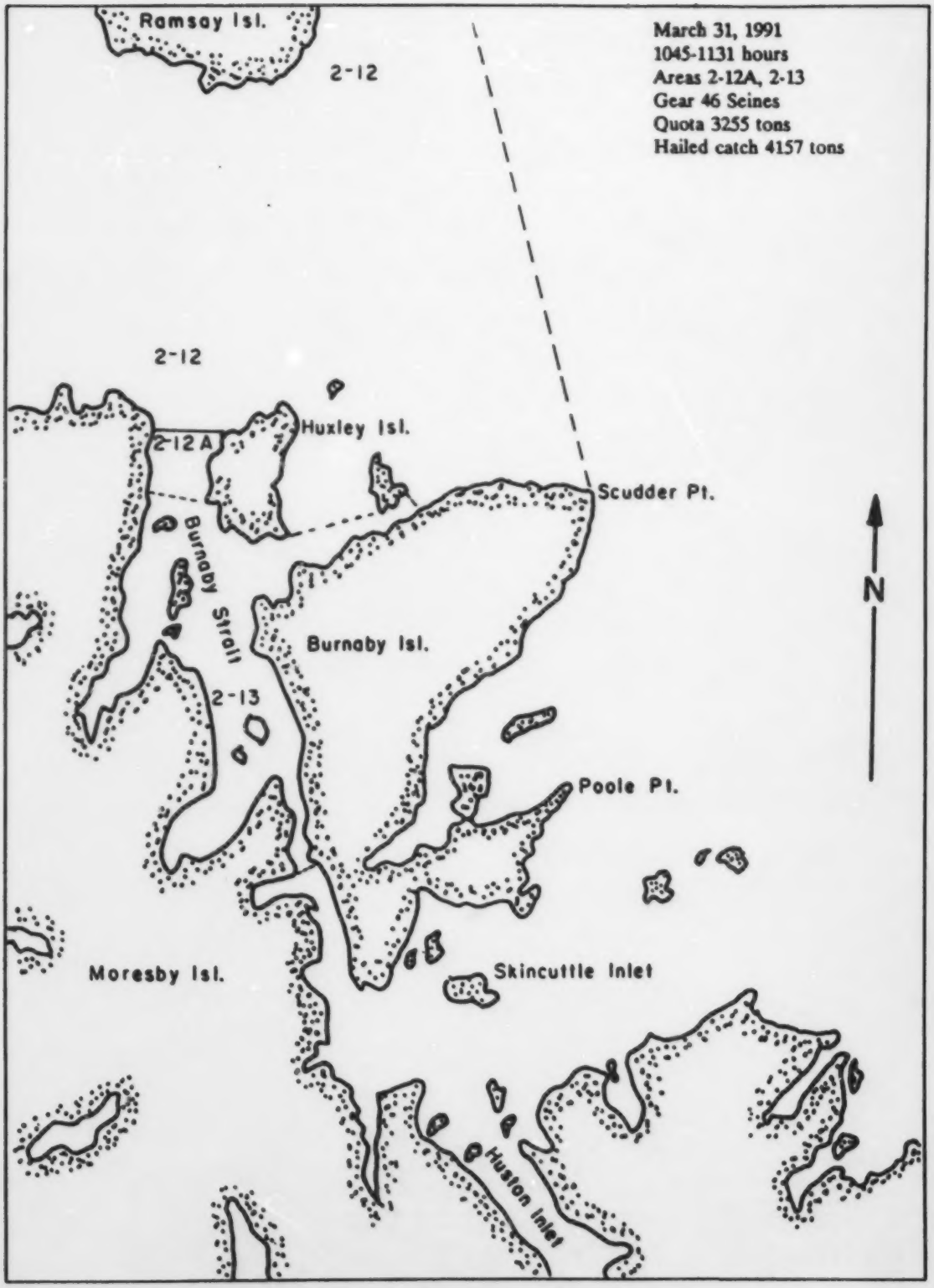

Fig. 10 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 2E, 1991

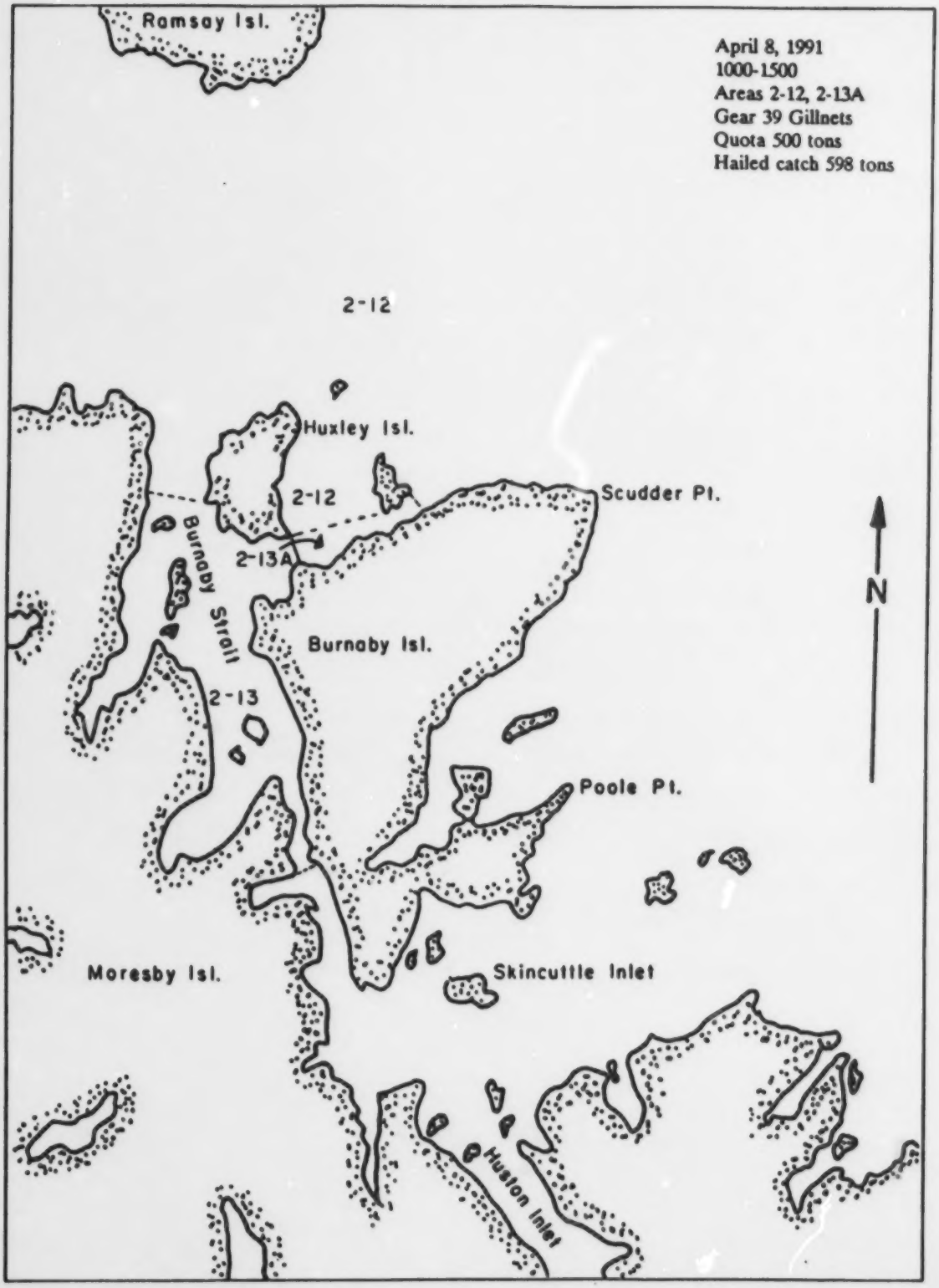

Fig. 11 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 2E, 1991

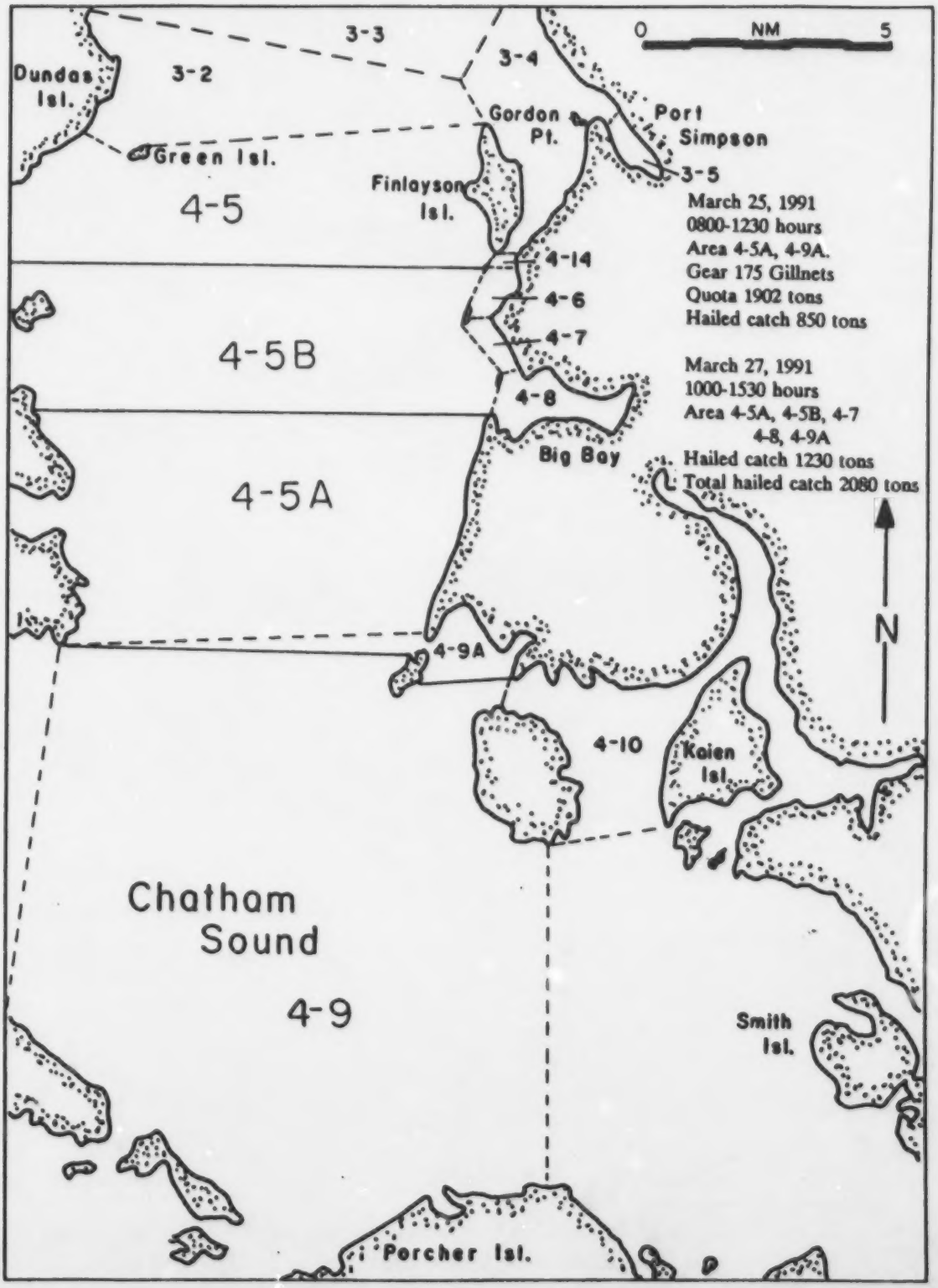

Fig. 12 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 3-4, 1991

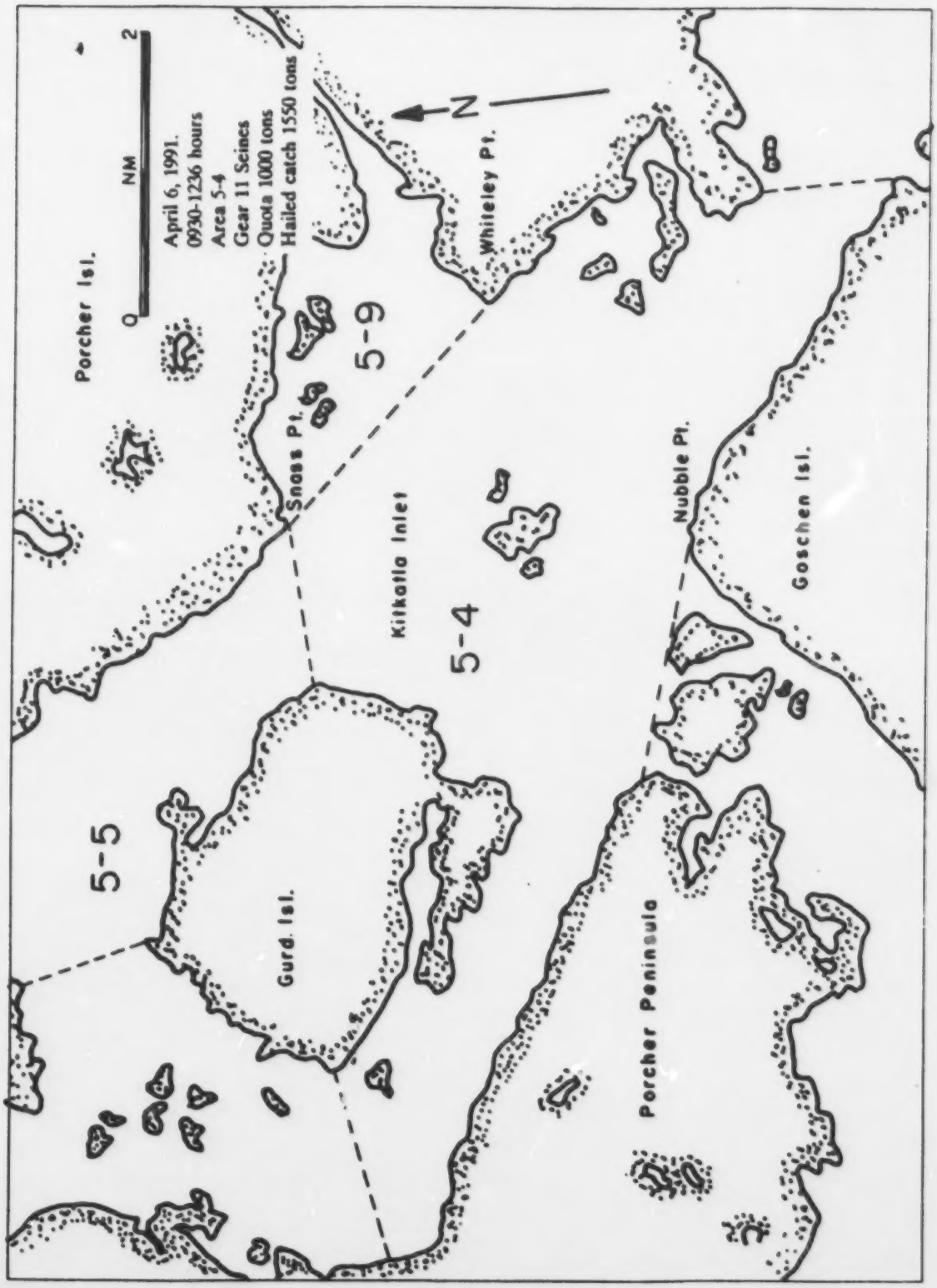

Fig. 13 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 5, 1991

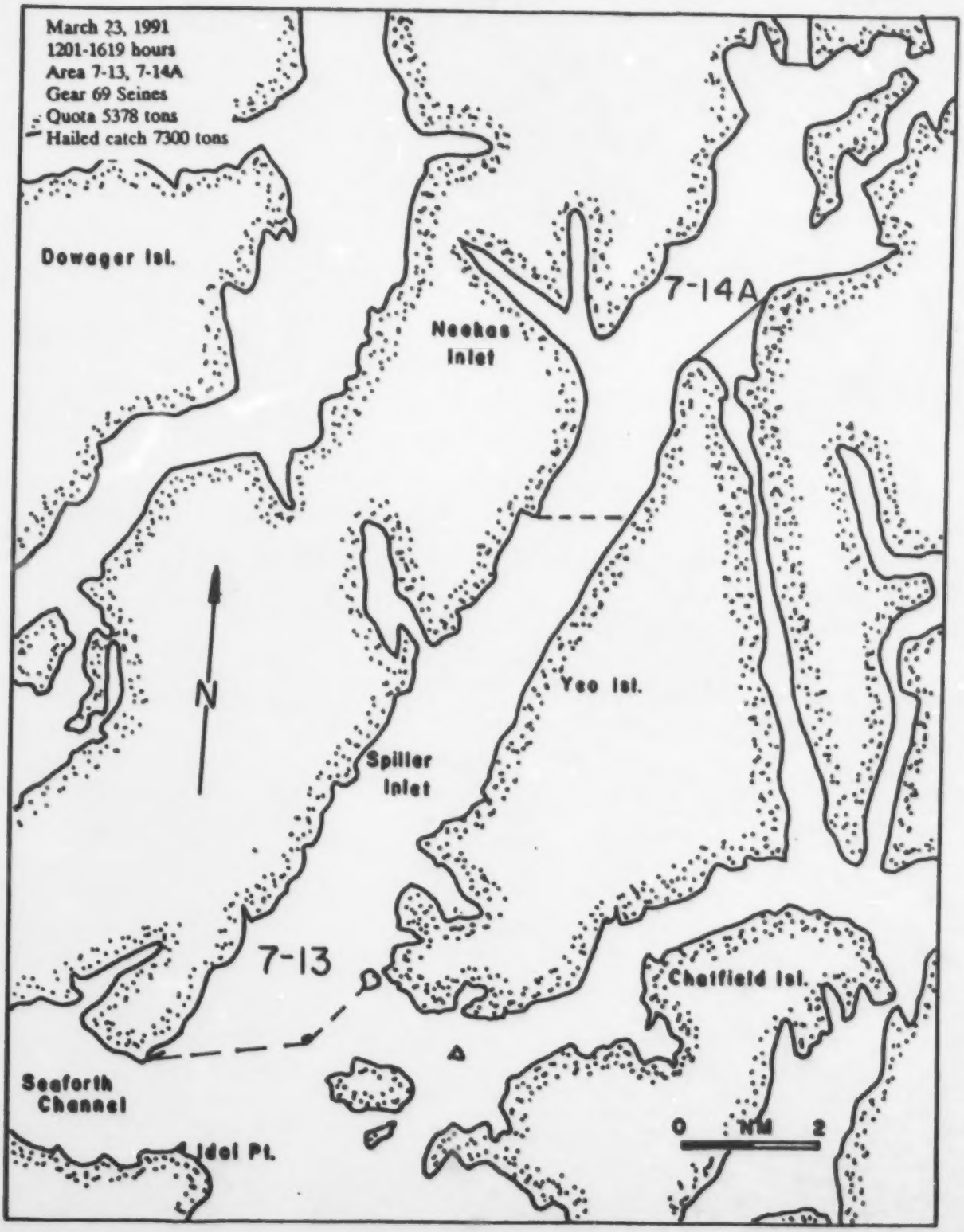

Fig. 14 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 7, 1991

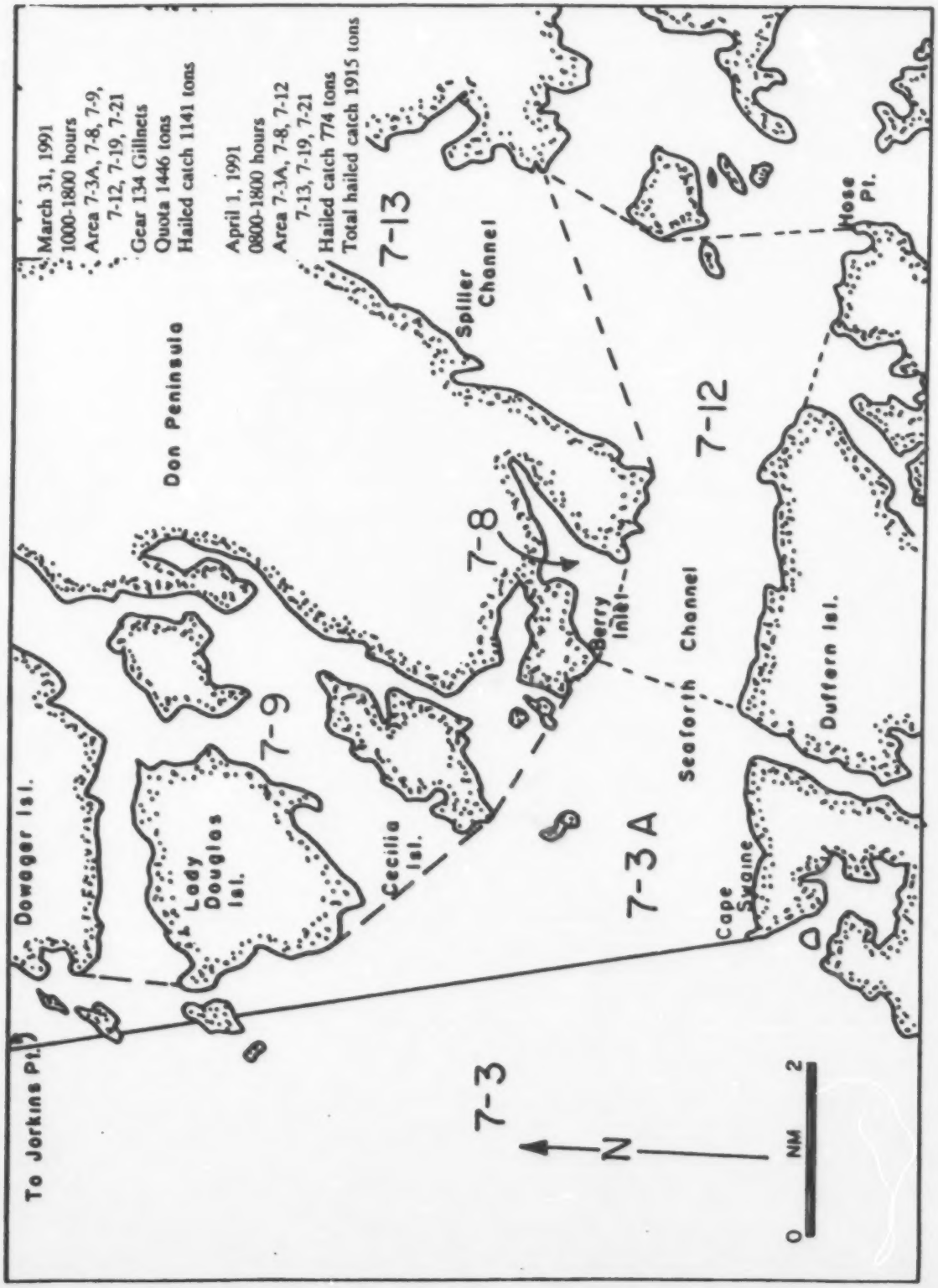

Fig. 15 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 7, 1991

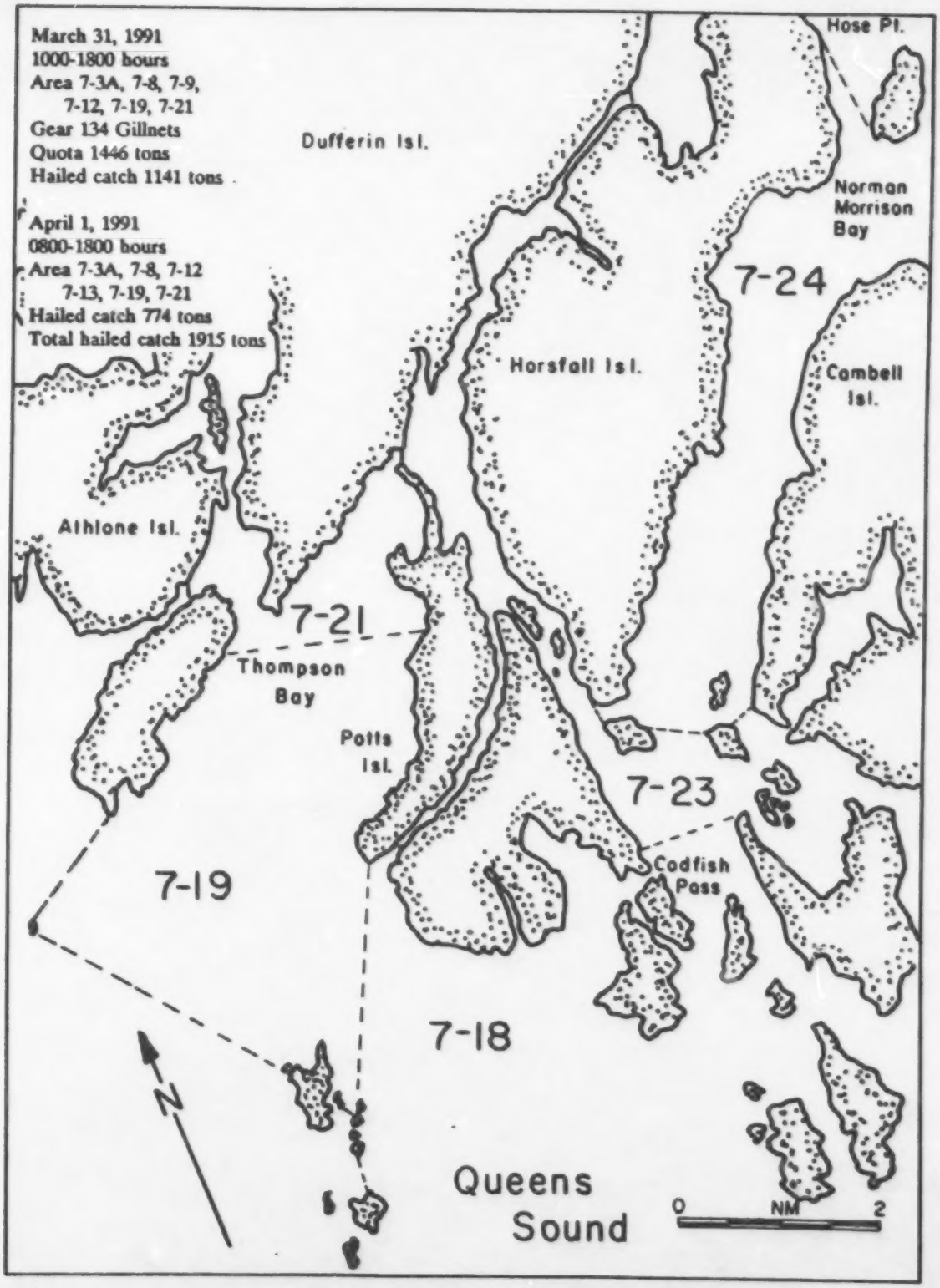

Fig. 16 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 7, 1991

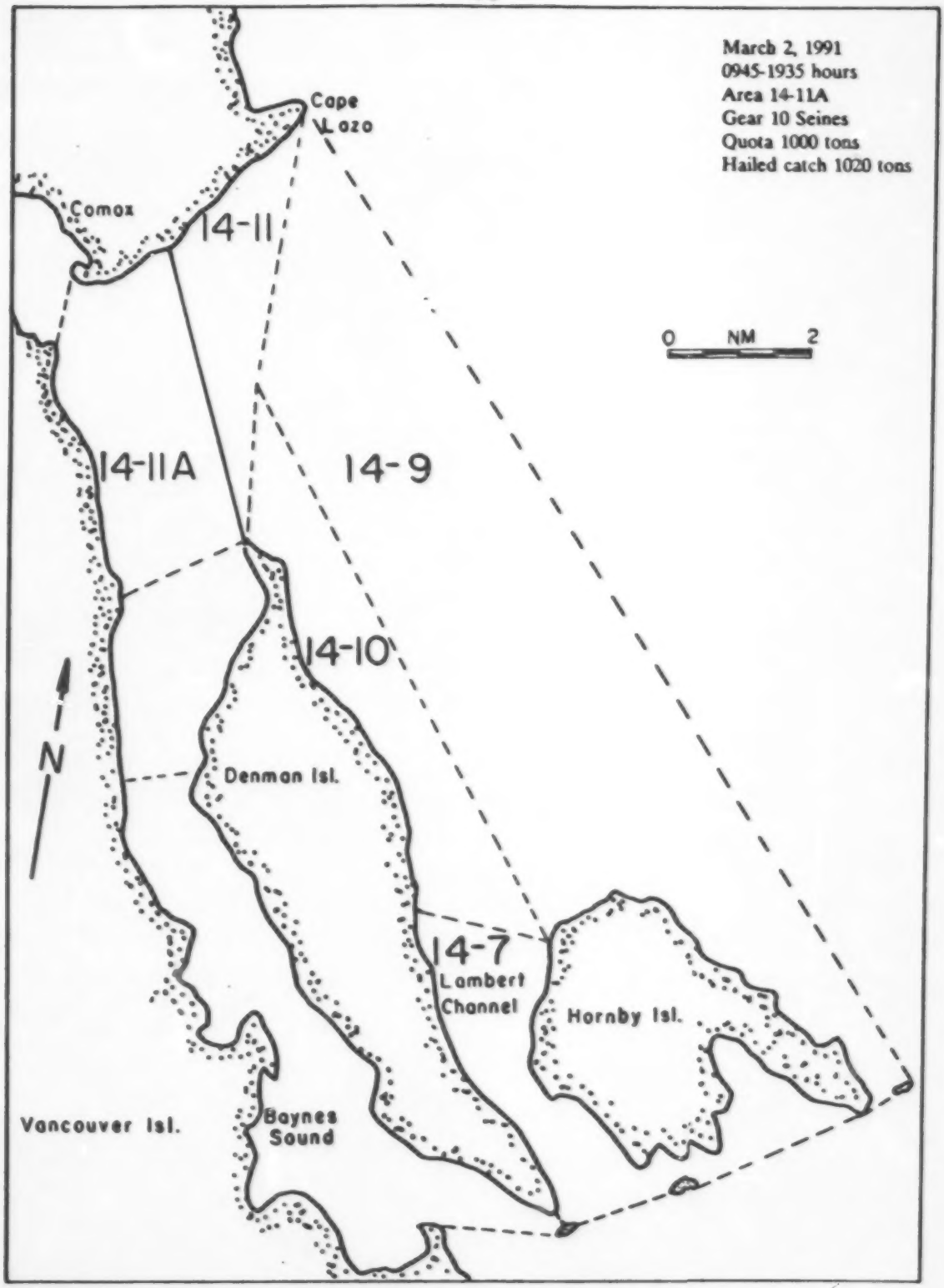

Fig. 17 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 14, 1991

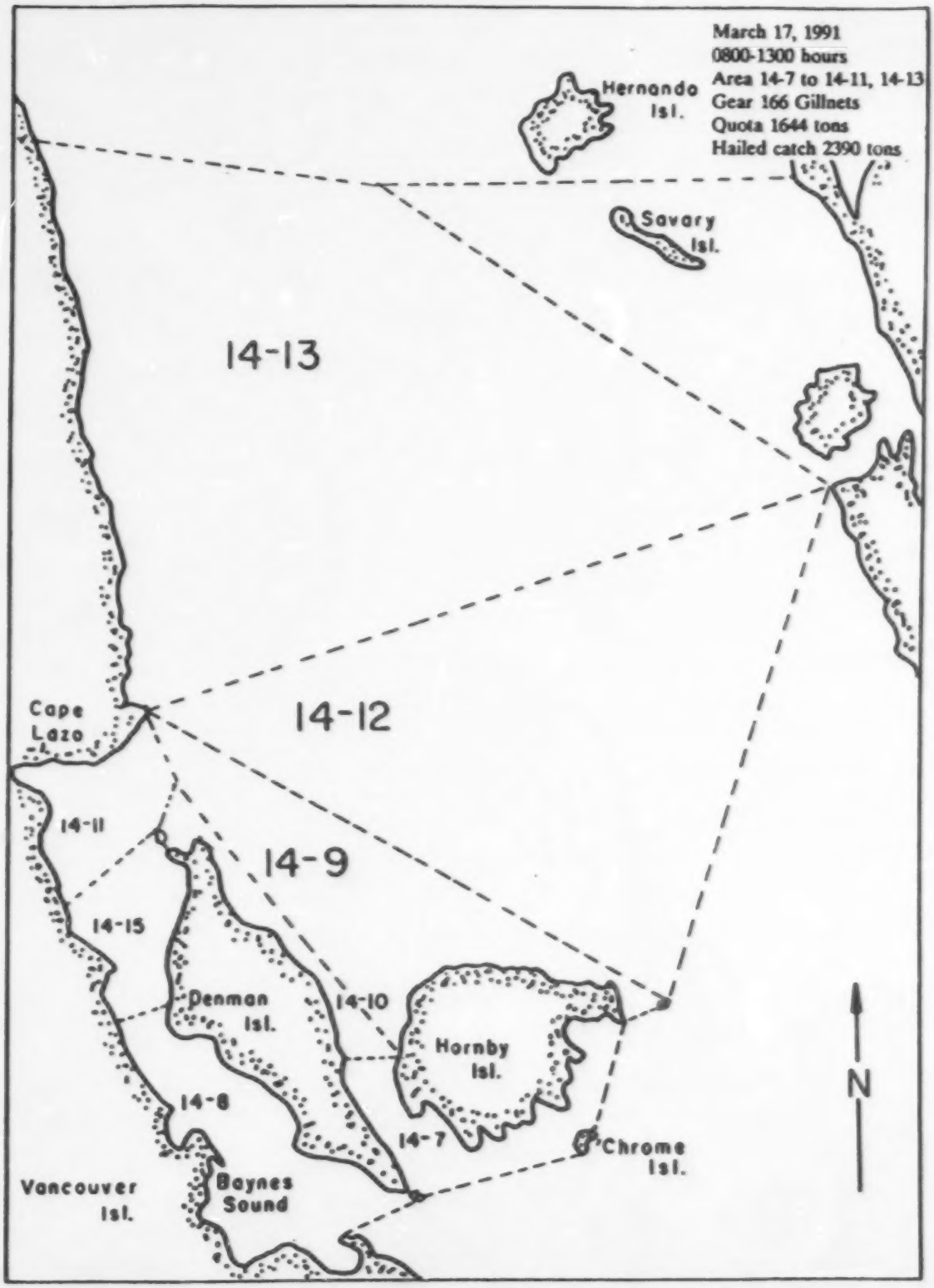

Fig. 18 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 14, 1991

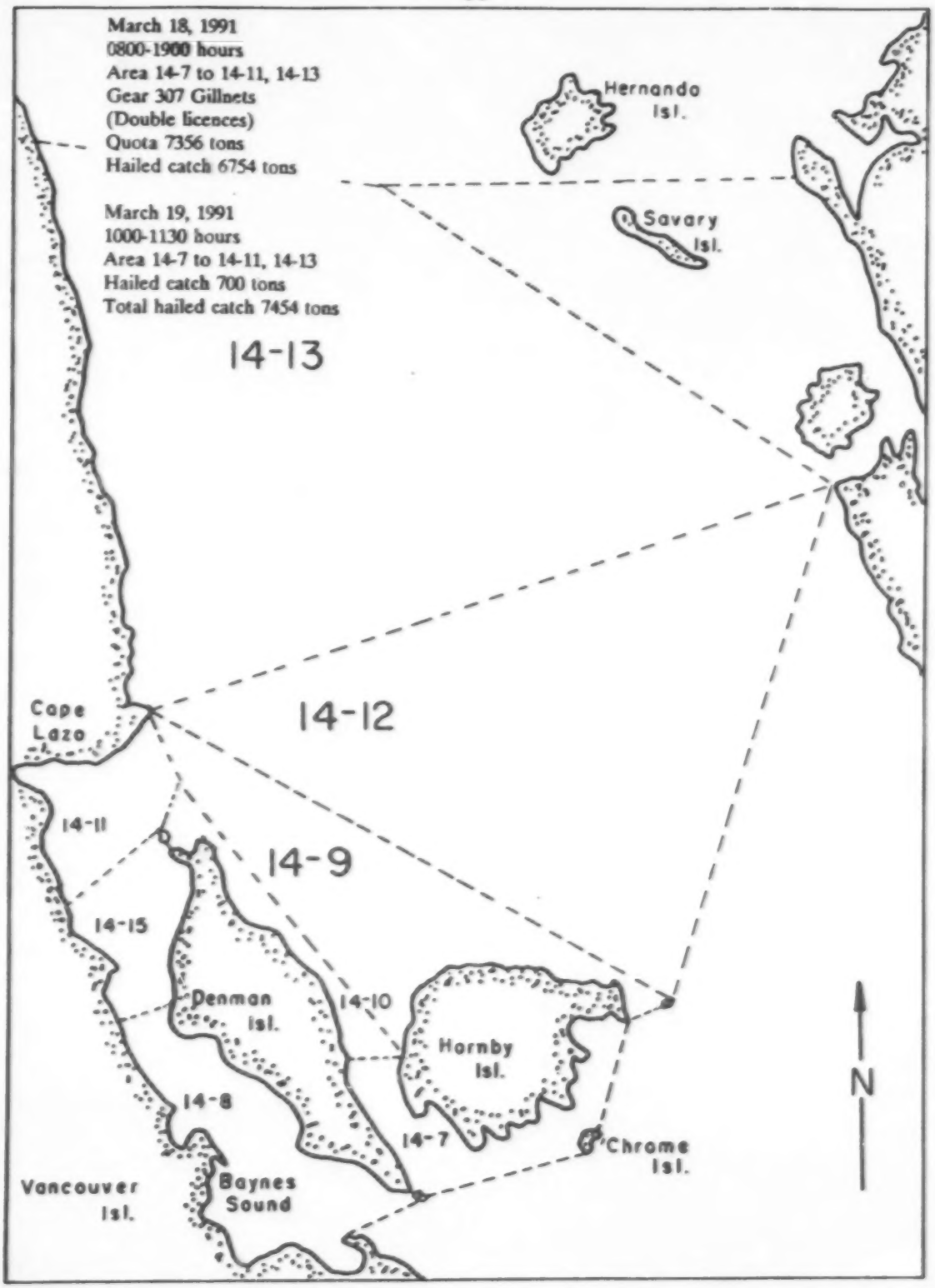

Fig. 19 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 14, 1991

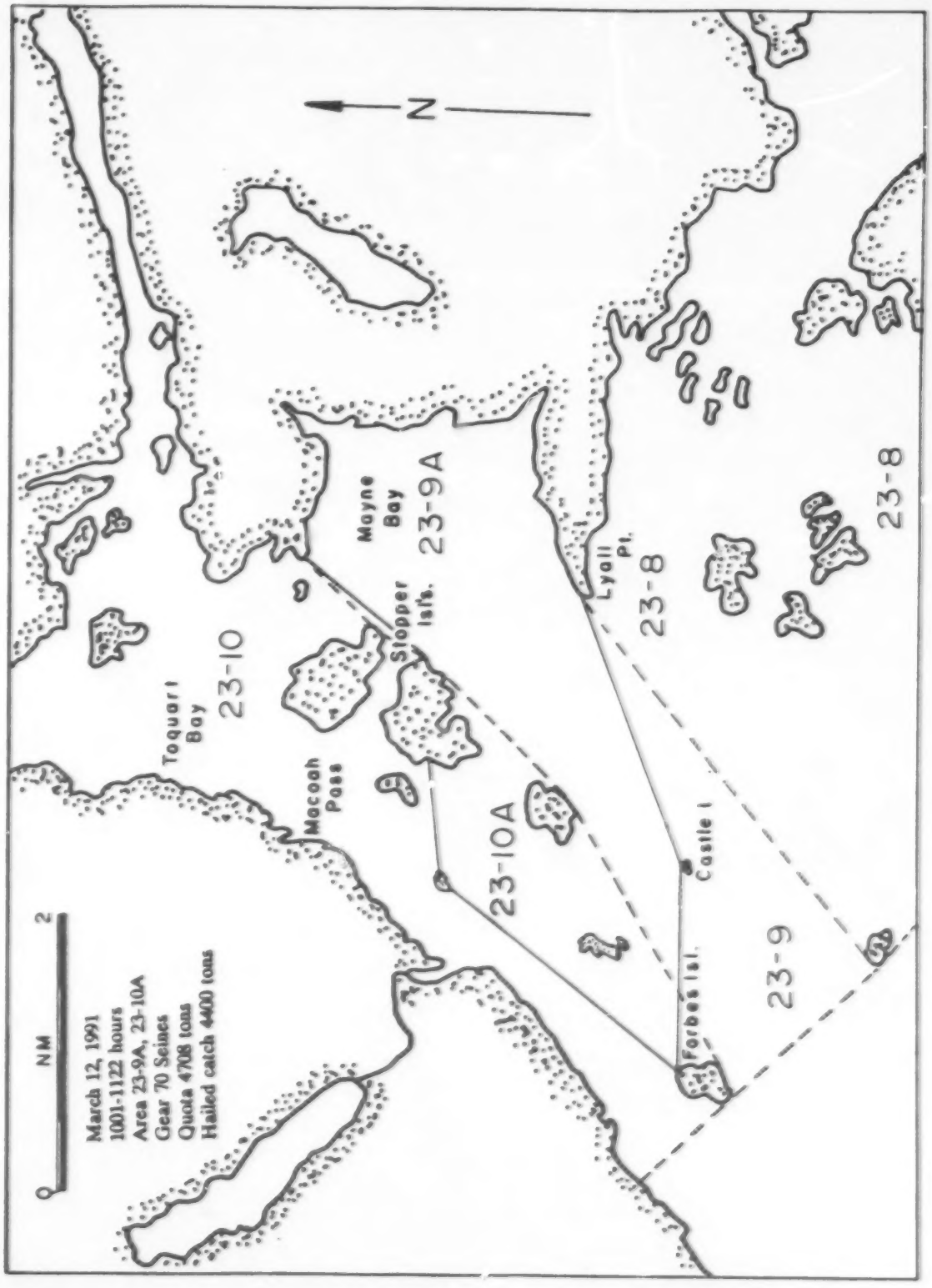

Fig. 20 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 23, 1991

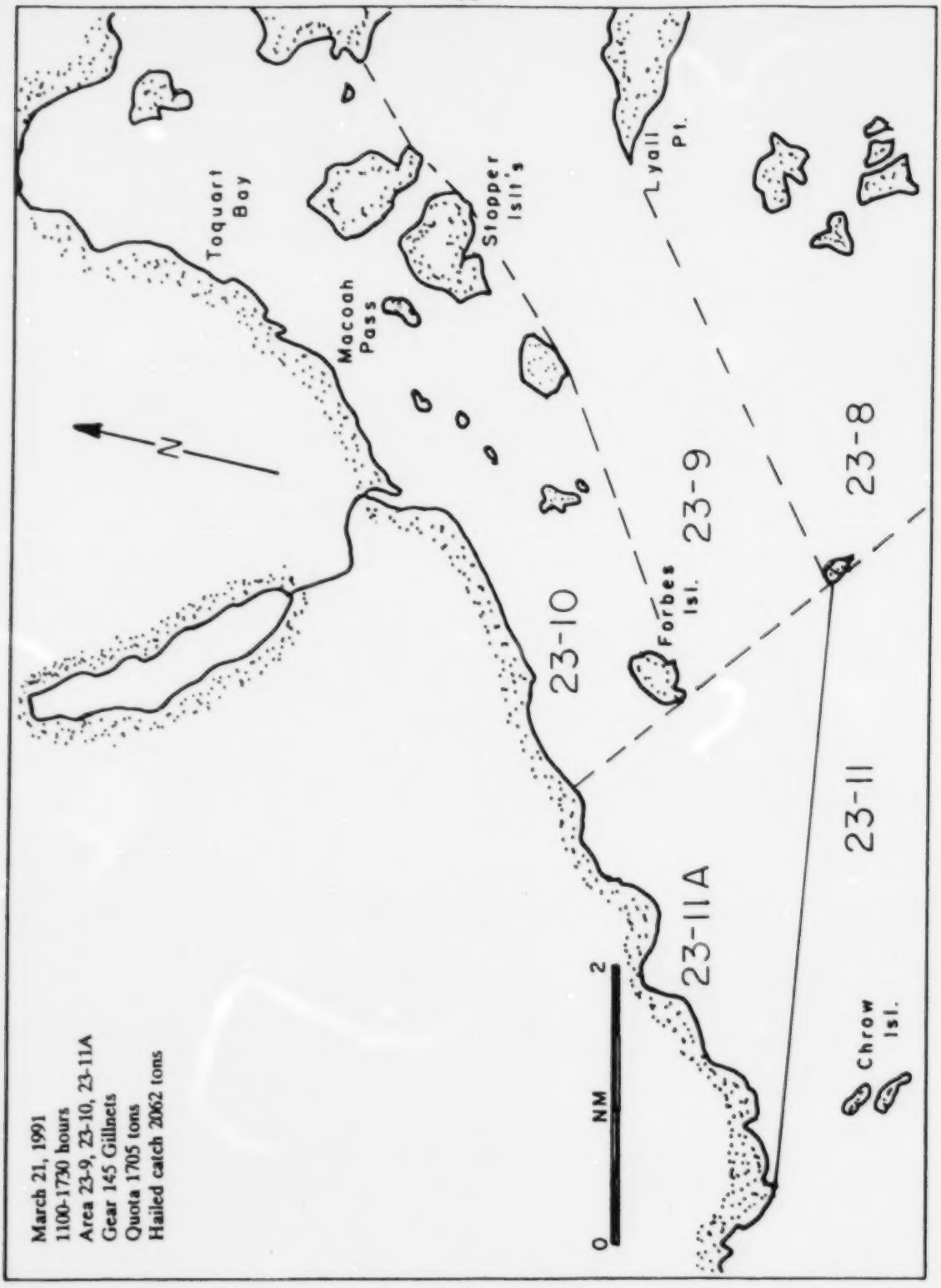

Fig. 21 Roe Herring Gillnet Fishing Boundries and Hailed Catches by Gear Type in Area 23, 1991

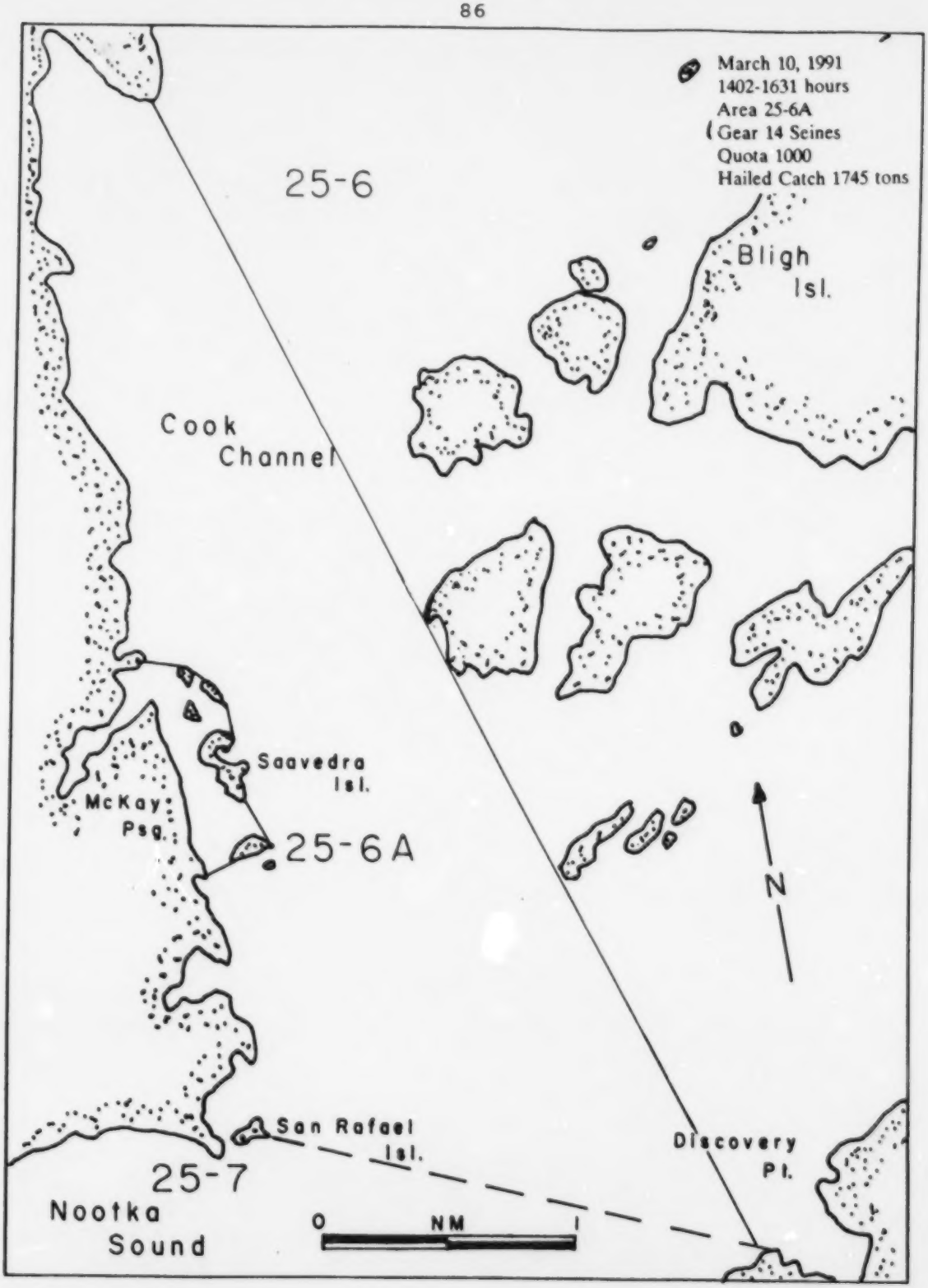

Fig. 22 Roe Herring Seine Fishing Boundries and Hailed Catches by Gear Type in Area 25, 1991

Fisheries
and Oceans

Fisheries - Pacific Region
Suite 400 - 555 West Hastings St.
Vancouver, B.C.
V6B 5G3

Pêches - Région du Pacifique
Pièce 400 - 555 rue Hastings ouest
Vancouver (C.-B.)
V6B 5G3

Your file Votre référence

Our file Notre référence

Re: MANAGEMENT PLAN 1990 OPEN FOOD AND BAIT FISHERY

Dear Sir/Madam:

The attached "Management Plan for the 1990 Open Food and Bait Fishery" provides information on all phases of this small herring fishery. The Herring Industry Advisory Board has reviewed these plans and agrees that the system herein described is a fair and equitable way to conduct this fishery given the potentially large number of qualified fishermen participants.

A lottery entry system has been utilized for the past five fishing seasons and has proven successful in limiting participation in a fair manner. For this reason a lottery system will be used in the 1990 season. Catch quotas for 1990 have remained the same coastwide as in 1989.

For those who are drawn to participate in the fishery, I wish you the best.

Yours very truly,

A. Gibson
Chief, Resource Allocation
and Industry Liaison

Att:

Canada

SEPTEMBER 1990

MANAGEMENT PLANS FOR THE 1990 OPEN HERRING FOOD AND BAIT FISHERY

The 1990 Food and Bait fishing season will commence on or after November 12th, in the South Coast and October 29 in the North Coast and terminate on or about December 14th, 1990. Opening dates for specific areas will be as described as a condition of the licence.

MANAGEMENT OBJECTIVES

1. CONSERVATION AND PROTECTION

All Herring caught under the auspices of the Open Food and Bait fishery are accounted for in the overall B.C. Herring Management Plan. Division of the total allowable catch into individual herring fisheries is made by Fishery managers so that the catch for each area does not exceed the overall quota for that area. The sum of the catch quotas in each area is approximately 20% of estimated returning adult spawning stock.

2. INTENDED USE OF THE OPEN FOOD AND BAIT FISHERY CATCH

Herring caught in this fishery is intended to provide a small quantity of herring to firms wanting to engage in secondary processing of food herring products and to satisfy the frozen bait requirements of commercial fishermen. All herring caught under this vessel quota system must, as a condition of the licence, be delivered to a British Columbia port for catch weigh-in. Any excess to the allotted 50 ton boat quota will be relinguished directly to the Crown. After the weigh-in any portion of these vessel quotas may be exported fresh, frozen or in a fully processed form.

3. ECONOMIC VIABILITY

The low quotas in this fishery over the past 9-10 years reflect the low value of herring destined for used as human food or frozen commercial bait. Other fisheries such as roe herring and herring spawn-on-kelp have much higher fishing quotas because the economic returns are much better.

4. PUBLIC HEALTH

Section 12 of the B.C. Fish Inspection Regulations states: "where fresh herring are destined for human consumption, processing, other than by icing or chilling, shall commence within 24 hours of delivery (offloading) at the processing establishment, and shall not be discontinued until the fish has been preserved to a degree which ensures maximum quality of the end product".

5. ENTRY AND LICENCING REQUIREMENTS

NORTH OF CAPE CAUTION

a) A total of 250 tons (150 tons in the Prince Rupert area and 100 tons in the Central Coast) will be allocated to processing companies in the North Coast. Each processor participating will identify one or more boats to fish their allocations.

SOUTH OF CAPE CAUTION

a) A total of 1000 tons will be allocated to fishermen by means of a lottery draw (Lottery form application attached). The 1000 ton allocation will be split between Johnstone Strait and the Strait of Georgia as follows:

   a) Johnstone Strait (Area 13): 100 tons

   b) Strait of Georgia (Area 17 and 18): 900 tons

b) The 1000 tons allocated to the Open Food and Bait Fishery south of Cape Caution will be issued in 50 ton lots. Two vessels will be draw selected to fish the 100 ton allocation in Johnstone Strait and 18 vessels will be draw selected to fish the 900 tons in the Strait of Georgia.

c) Each interested vessel owner may submit an application to fish in only one area. Lottery applications will be accepted at the Prince Rupert and Vancouver Offices, commencing on October 8, 1990 and terminating at 2:00 p.m. on October 19, 1990. The draw will be conducted by an Industry representative on October 22, 1990, in Vancouver, and Industry will be notified of qualifying vessels via telex.

d) Each vessel may be entered on one application only.

6. LICENCING OF VESSELS

Licences for the Food and Bait Herring fishery will be issued in the "Z" category for 1990 with a $50.00 licence fee. "Z" applications need only be submitted by vessel owners who are successful in the lottery draw and the following requirements apply.

a) The vessel or owner must licence for 1990 in one of the "A" seine, "H" or "T" licence categories.

b) Vessels catching or transporting herring during the fishery may require inspection of the fish hold and refrigeration systems prior to issuance of the licence. A properly functioning chilled sea water

(C.S.W.) or refrigerated sea water (R.S.W.) system is required for all vessels participating in the fishery.

c) Licence conditions will include:

i) 50 ton quota per licence.

ii) Catch and hail reporting requirements.

iii) Seine vessels must have the herring seine on the drum prior to the fishery opening. This may help reduce the incidence of large sets (exceeding the 50 ton quota).

d) Licences are non-transferable.

7. ADMINISTRATION AND REGULATION OF THE FISHERY

a) A herring purse seine must not exceed 500 m (275 fathoms) in length and the mesh size shall not be less than 25 mm (1") extension measure.

b) Areas may be closed in the event that small, damaged or unsuitable fish are being spilled, or if substantial incidental catches of salmon occur.

c) No vessel will be licenced to catch, have on board, or deliver more than 50 tons of herring. In the event more than 50 tons are delivered, a relinquishment (form attached) of the excess herring will be made by the fishermen/licence holder directly to the Crown.

d) Vessels must hail catch tonnage that is taken aboard to a designated patrol vessel prior to leaving the fishing grounds. Destination (plant name and location) and time of arrival at the plant must be given to the designated patrol vessel/officer.

e) All deliveries must be offloaded within 18 hours of capture. The onus is on the vessel master to clear with the plants for reserved offloading.

f) Loads will be subject to consistent monitoring for quality. Failure to comply with any of the conditions of the licence may result in cancellation of the licence and possible cancellation of other future fishing privileges.

g) Seizure of catch, fishing vessel, and fishing gear, may occur if it is found that any of the following conditions of the Food and Bait Fishing Licence, issued under the Pacific Herring Fishery Regulations [Section 18 (2)] are violated:

i) The commencement and termination dates;
ii) the location of the fishery;
iii) the identity of the fishing vessel;
iv) the type of gear to be used;
v) the quantity of fish that may be caught, held on board, and delivered; and,
vi) the means of handling and storing the catch.

h) The mesh size of a trawl net cod end should not be less than 25 mm (1") extension measure.

ATTACHMENT

DEPARTMENT OF FISHERIES AND OCEANS

FILE

RELINQUISHMENT OF CLAIM

NAME: ADDRESS: PROVINCE: TELEPHONE:

BY THESE PRESENTS, ON MY BEHALF OR ON THE BEHALF OF MY HEIRS, EXECUTORS OR ADMINISTRATOR RELEASE FOREVER THE GOVERNMENT OF CANADA AND THE DEPARTMENT OF FISHERIES AND OCEANS FROM ALL MANNER OF ACTIONS, CLAIMS, SUITS OR DEMANDS IN ANY WAY AND DECLARE BEING FULLY SATISFIED WITH THE ACTION TAKEN AND THE SETTLEMENT OF THE FOLLOWING:

DESCRIPTION

_____

_____

_____

_____

_____

_____

_____

_____ _____

Witness Signature

_____ _____

Date Date

1990 OPEN HERRING FOOD AND BAIT FISHERY

BOAT QUOTA LOTTERY SYSTEM

I, _____, the owner/operator of the herring fishing vessel _____, type of Licence (ie. "A"' "H" or "T") _____and CFV #_____, submit application to enter the 1990 Herring Food Bait 50 ton quota lottery system. My vessel has a functional R.S.W. ☐ C.S.W. ☐ refrigeration system.

ENTRY DETAILS

1. Food & Bait fishing licences will be issued to 20 vessels in the 1990 Fishery;

   18 vessels will be allotted 50 ton quotas to be taken in the Strait of Georgia (Areas 17 & 18) and 2 vessels will be allocated 50 tons to be taken in Johnstone Strait (Area 13).

2. All entries must be received at the Vancouver or Prince Rupert office no later than 2:00 p.m. on October 19, 1990.

3. Licences for this fishery are non-transferable between vessels.

4. Each applicant must meet the following entry criteria:

   a) Each applicant must have a valid "A" seine, "T" or "H" seine licence.
   b) All vessels must have and use functioning R.S.W. or C.S.W. systems.
   c) Each vessel may only be entered once, therefore;

   Check one box only:

   A. Johnstone Strait ☐ (2 boats to be chosen)

   B. Strait of Georgia ☐ (18 boats to be chosen)

   d) All seine nets must be on the drum prior to fishing. It is hoped that this will reduce the incidence of large sets.

SIGNED:_____

DATED:_____

Fisheries
and Oceans

94

Pacific Region
Suite 400 - 555 West Hastings St.
Vancouver, B.C.
V6B 5G3

Region du Pacifique
Pièce 400 - 555 rue Hastings ouest
Vancouver (C.-B.)
V6B 5G3

Your file Votre référence

Our file Notre référence

DEC 07 1990

Roe Herring Industry

The 1991 Roe Herring Fishery Management Plan that is enclosed describes the licensing, inspection and management systems that will be used for your 1991 roe fishery. The allocation of 32,339 short tons of herring for catch is well above the 26,467 tons averaged between 1983 and 1989. The quota will be allocated to licensed seiners and gillnetters on a 55% to seiners and 45% to gillnetters on a coastwide basis. This means the quotas allocated to seiners will be 17786 tons and to gillnetters 14553 tons.

Provision has been made for fisheries for each gear type in each of the five major areas as follows:

LICENSE AREA	SEINE QUOTA (Ideal No.Gear)	GILLNET QUOTA (Ideal No.Gear)
QCI 2E	3255 (44)	500 (46)
2W	1445 (19)	- -
RUPERT	1000 (14)	1902 (173)
CENTRAL	5378 (72)	1446 (132)
ST.OF GEORGIA	1000 (13)	1644 (150) 7356 (335)*
WEST COAST VAN. 24-25	1000 (14)	1705 (156)
23	4708 (63)	- -

*DOUBLE LICENSED

Please remember that area selections are to be made on the application and this area selection will be considered final unless a WRITTEN request to change areas is received by Tuesday, January 15, 1991. Commencing December 20, 1990 the Department will telex up-to-date tallies of area application figures as we receive them.

If after January 15, there is an excessive imbalance in the amount of gear in any area, a short time period will be set up to allow for changes from the over subscribed area(s) in order to distribute the gear more evenly.

For gillnetters a DOUBLE LICENSE system will be implemented in the second Strait of Georgia gillnet fishery. The first gillnet fishery there will be single licensed for a small fleet.

Fishermen when choosing their areas should be aware that early fisheries in QCI (Port Louis) and CENTRAL (Spiller Ch.) for example could adversely effect those who choose to license themselves for more than one area.

Last November the Minister announced that he wished to expand the Herring Spawn-on-Kelp (SOK) fishery by up to ten new licenses to Native Bands. In keeping with the Minister's announcement roe herring licenses will have to be traded in (one seine or six gillnet) for each new SOK license. Additionally the appropriate tonnage allocated to this amount of gear would be reallocated from the roe fishery to the new SOK licenses. The Minister has recently advised the recipient Bands but at this time we have no indication whether the Bands wish to operate in 1991 or what gear licenses will be traded. When this information is known minor changes to roe quotas may be made.

Information that may help fishermen choose their fishing areas, such as historical quotas,catches and fishery timing data are attached.

If additional information is required, please contact: Lloyd Webb, 666-0207 or Alan Gibson 666-6931 in Vancouver, Norm Lemmen, 624-0416 in Prince Rupert or Paul Sprout in Nanaimo, 756-7280.

Yours truly

A.F.Lill,P.Eng.
Regional Director
Fisheries Branch
Pacific Region

November 1990

MANAGEMENT PLAN FOR THE 1991 ROE HERRING FISHERY

The B.C. Pacific Roe Herring fishery generally takes place in late February to March in southern B.C. and mid March to mid April in North Coast waters with specific opening dates and times announced on the fishing grounds by fishery managers.

The Area Licencing Management System will be implemented again for the 1991 season with important changes outlined below. The catch quota is based on a fixed exploitation rate of returning harvestable stocks. If recruitment is more or less than predicted the predetermined quota will not be adjusted in the current year. Accordingly, catch adjustments will be made the following year after escapement measurements and other stock status information are analyzed.

CATCH QUOTAS BY GEAR TYPE AND AREA (SHORT TONS)

LICENCE AREA		SEINES	GILLNETS	TOTAL
Queen Charlotte Is.	(2E)	3255	500	3755
	(2W)	1445	0	1445
Prince Rupert		1000	1902	2902
Central Coast		5378	1446	6824
Strait of Georgia		1000	1644 7356	10000
West Coast Van.	(24-25)	1000	1705	2705
	(23)	4708		4708
		17786	14553	32339

1. Concern has been expressed by both industry and DFO fishery managers over the large number of gillnet licences in the Strait of Georgia last year and again this season. For 1991, the DFO, under advisement of the Herring Industry Advisory Board, has decided to divide the Strait of Georgia gillnet fleet into two separate licenced fleets. The first fleet will have a relatively small quota of 1644 tons with approximately 150 single licences. This small number of skiffs will be able to start first on a relatively small spawning. The second fleet will have a much larger quota of 7356 tons and to reduce the number of skiffs operating to about 335 the "DOUBLE LICENCE" system will be used again in 1991. This will be done by requiring two roe herring gillnet licences to fish one skiff for this second fleet in the

Strait of Georgia. Of course the average quota available for the second "DOUBLE" licenced gillnetters will be twice that of the first fleet. This system will provide for better management of the fishery as well as increase fishing opportunities for fishermen and increase the potential for higher roe yields.

2. Stocks will be monitored in all major fishing areas and openings will be declared when warranted up to the limit of each licence areas gear quota.

3. South of Cape Caution no openings are anticipated in the Johnstone Strait area.

4. This is a general outline of the 1991 Herring Management Plan and does not supersede the appropriate Fisheries Regulations.

MANAGEMENT OBJECTIVES

1. CONSERVATION AND PROTECTION

The total B.C. Roe Herring catch in 1991 is 32339 short tons. All herring caught in the roe fishery are accounted for in the overall B.C. Herring Management Allocation Plan. Allocation of catch to all herring fisheries are made by fishery managers so that the sum total the fishery quotas for each area does not exceed the overall fishing quota for that area. The sum of the catch quotas in each area approximates 20% of the estimated stock tonnage as forecasted by the Pacific Stock Assessment Review Committee.

2. INTENDED USE OF CATCH

Herring caught in this fishery will have the roe removed for the Japanese market for Kazanoko (salted herring roe). The female carcass and the male fish are manufactured into meal and oil. The meal is mainly used for salmon hatchery/aquaculture feed and the oil mainly for food and industrial products.

3. ECONOMIC VIABILITY

Since 1972 the Roe Herring fishery has had the largest quotas of any B.C. herring fishery and reflects the lucrative nature of this fishery. Annual landings in the 1980's are about 30-35 thousand tons with landed values to fishermen exceeding $70 million each season. The roe herring fishery provides substantial income to the industry at a time of year when the salmon fishing fleet is idle.

4. PUBLIC HEALTH

The B.C. Fish Inspection Regulations Require:

a. That all herring gillnet skiffs have areas where fishermen can stand to avoid standing on/in the herring. Fuel and hydraulic oil pump reservoir areas and fish holding areas must be separate. Skiffs should have self bailing systems for fish holds and standing areas separate from oil contaminated areas. No unpainted wood may come in contact with fish. Random inspections will be conducted on the fishing grounds.

b. That all herring seines have their fish holds inspected. Licencing seine vessels for catching/carrying fish requires that the vessel and its fish hold comply with rigid inspection criteria. Deck loads are not permitted.

c. All herring offloaded or processed in B.C. must be done at inspected processing plants. Processing of herring for human consumption requires handling and preservation "To a degree which ensures maximum quality of the end product" (Sec. 12 B.C. Fish Inspection Regs.).

5. LICENCE REQUIREMENTS

Note: Powers of Attorney are no longer accepted on any documentation. All forms must be signed by the licence holder of record.

A. AREA CHOICE

a. The area marked on the licence application will be considered a final choice unless a written request to change areas is received by Monday January 15, 1991. Applications sent in without an area choice marked will not be considered complete. Completed applications must be received or postmarked no later than January 15. Fishermen are encouraged to send in applications as soon as possible. This will help us to provide better information on area choices as they are received.

b. Area choice totals will be telexed to Industry and field offices regularly starting on January 5, 1991.

c. Fishermen should check the area choice totals in order to decide whether or not they wish to request a change in area before the January 15 deadline.

B. APPLICATIONS

a. Applications may be delivered or mailed to either the Vancouver or Prince Rupert Licencing office.

b. Applications will be processed by DFO Licensing after the January 15th deadline. Arrangements may be made, (on the form provided for this

purpose), to pick up the licence either in our Vancouver or Prince Rupert office or to have it mailed. If you wish to pick up the licence personally, please provide us with a telephone number where we may contact you when the licence is ready.

C. GILLNET LICENSING

a. C.F.V. Plates

C.F.V. Plates are no longer required for skiffs used only in the roe herring fishery. These have been recalled and may be returned to any departmental office in the Pacific Region. This includes District and Sub-District offices. Note: Skiffs which are also licensed in the 'C' category, (these have been issued two C.F.V. plates) should not return the plates, these should be left on the skiff.

b. Gillnet Plates

Roe herring gillnet licence plates (white in colour) were issued to all licence holders in 1987. These plates are to be used again this year. The previous year's decals must be removed before applying the 1991 decal. To make removal easier, it is suggested that the plate be heated briefly; try using a heat gun or a hair dryer on the back of the plate. The licence holder may fish any skiff he chooses, subject to the following conditions:

i) Gillnet skiffs must display a D.O.T. number (13K, 6K, etc.).
ii) The skiff must meet all fish hold inspection standards. Car top or smaller skiffs may not be used.
iii) Roe Herring licence plates with the 1991 decal attached, must be securely fastened to the "stern end" of the skiff and be visible at all times off the stern and remain in place until the fishery closes and the fish are delivered.

As in previous years, a net decal (smaller decal) will be issued along with the skiff decal. The net decal must be fastened to the scotchman or buoy at one end of the net. The scotchman must be clean and dry in order for the decal to adhere properly. The same end should be marked with a flag to show where the decal may be found.

The skiff which pulls the net must have the matching number decal and gillnet licence plate attached to the stern.

c. Special Provisions for the Strait of Georgia Gillnet

Roe Herring Gillnet fishermen in the Strait of Georgia will have two separate licence groups as follows:

(a) The first group will be licenced as usual with one licence one punt. This group of gillnetters will fish first in the Strait of Georgia.

(b) The second group must be double licenced for that area. Only one of the two licences assigned will be issued prior to the fishery; the second licence will be issued after the fishery is over. Further only one net may be fished from each double-licenced skiff.

If you wish to fish in the in the Strait on Georgia in 1991 in the second double licenced fleet you must do the following:

(a) complete a licence application for each of the two licences which will be assigned to that vessel, (the licence application must be signed by the licence holder);

(b) complete a "Strait of Georgia Area Double-Licence Choice Form";

(c) staple or otherwise secure the two licence applications and both fees, the choice form (blue) and the release form (yellow) together and mail the package to the Licencing Division, Vancouver, or drop it off at either our Prince Rupert or Vancouver Licence Division office.

D. SEINE LICENSING

a. Roe Herring seine licence holders must name the boat to be used in the 1991 fishery.

b. After the 1991 application is delivered to the Department a request to change vessels may be considered if requested in writing by January 15, 1991.

c. One decal will be issued with each roe herring seine licence and must be fastened to the STARBOARD SIDE of the wheelhouse or hull prior to the fishery.

E. REPLACEMENT DECALS

Declarations for lost decals should be made to Fishery Officers on the fishing grounds prior to an area opening. If the loss is confirmed a replacement decal will be issued for a $10.00 fee. The replacement decal will be designated by an "R" and will be for the same area as the decal which was lost.

F. OPERATOR RESTRICTIONS

For the 1991 roe herring season, a licence holder may allow his licence to be fished by another person. Where an Indian has been issued a roe herring licence, an Indian must be on board the licensed vessel while it is engaged in the roe herring fishery.

G. LICENCE FEES

Roe herring, category H, issued to a non-Indian

a)	Roe Herring Gillnet	$ 200.00
b)	Roe Herring Seine	$2,000.00

Roe herring, category H, issued to an Indian $10.00

6. ROE HERRING FISHERY REGULATIONS

A. GILLNET

a. No person shall use more than one section of herring gillnet. No person shall use a gillnet that is greater than 135 m in length.

b. **No person shall have a gillnet** containing more than 100 meshes in depth, the mesh size of **which is less than 57 mm** (2.25 inches) and not greater than 64 mm (2.5 inches) **on the fishing grounds** (as a condition of each gillnet licence).

c. Shaker panels shall not exceed a depth of 2 m with a mesh size not less than 150mm (6 inches).

d. Gillnets must be marked on both ends with buoys not less than 125 cm in circumference, and be of similar colour.

e. Gillnet fishermen must attach a gillnet licence decal to one end of his gillnet. A gillnet licence net decal shall:

a) be issued to the applicant with his herring roe licence;
b) be valid only for the licence with which it was issued;
c) be clearly visible and at least 30 cm above the surface of the water; and
d) match the number on the skiff fishing that net.

f. When fishing with gillnets, no person shall leave any anchors, buoys or lines in the water during any closed time.

g. In fishing for roe herring from a punt, or while having roe herring aboard a punt, no person shall use or carry a greater length or depth or net in a hung condition than is permitted by the Pacific Herring Fishery Regulations. It should be noted that extra legal sized nets may be carried on accommodation vessels or motherships.

B. SEINE

A herring purse seine shall not be greater than 500 m (275 fathoms) in length, and mesh size not less than 25 mm (1 inch) extension measure.

7. ADMINISTRATION OF THE 1990 ROE HERRING FISHERY

1. The 55%/45% seine: gillnet catch division will apply in the 1991 fishery on an overall coastwide basis.

2. The Department will retain the one net per punt restriction for gillnets for the 1991 season.

3. Fishery Officers will ensure that sensitive herring spawning areas are protected from gear damage by establishing shallow water net boundaries inside which no fishing shall take place.

4. Vessels transferring catches from hold to hold must stand off the spawning grounds in areas designated as gurry grounds by the Fishery Officer according to Section 43 of the Fisheries Act.

5. The Department will continue its policy of attempting to achieve the best percentage of roe recovery compatible with sound conservation principles. It is the intention of the Department to open fisheries at the earliest opportunity given adequate stock size to quickly achieve assigned quotas and get optimum roe maturities. (i.e. Seine fisheries have taken place as early as March 11 in the Central Coast (Spiller Channel-1985) and the potential exists for early fisheries in the Queen Charlotte Islands (Louscoone Inlet, Huston Inlet, Port Louis).

6. The precise opening time for seines will not be announced in advance. A time period in which the opening will occur will be announced on channels 78A VHF and 2318 HF; however, the precise opening time will occur within the time period previously set out. This opening announcement will be made on channel 79B VIIII.

7. Gillnet fishery opening times will be announced as far in advance as possible and 78A and 2318 HF will be used.

8. Notice of closure will be as short as required for conservation purposes. For gillnet closures, enough notice will be given to provide reasonable opportunity for fishermen to remove their fishing gear from the water. For seines no notice of closure will be provided.

9. An attempt will be made to broadcast to the fleet anticipated times to fulfilment of expected catch quotas for an area to prevent vessels from travelling unnecessarily to areas that would probably close before they arrived.

10. Fishermen not licenced for the given area and the licenced packer vessel fleet must stand off fishing areas as designated by a Fishery Officer. Non compliance may result in a loss of fishing opportunities or prosecution.

11. The fleet is requested to avoid excessive disturbance of herring caused by vessels running back and forth over schools prior to openings. In some cases specific requests to stay off particular areas will be broadcast from patrol vessels and fishermen will be expected to comply.

12. Gillnet fishermen may use the net drum on their salmon fishing vessel to pull their roe herring gillnets across their punts, provided:

    - the punt is fishing a licence issued for the appropriate area;

    - all persons aboard the vessel engaged in the operation hold valid personal commercial fishing licences.

8. REPORTING OF CATCH

Catch by roe herring gillnet skiffs is to be reported under the "H" licence number.

Seine catch can continue to be reported under the C.F.V. # of Catching vessel, although the addition of the licence number to the sales slip will also be helpful.

ADDITIONAL INFORMATION TO ASSIST
IN CHOOSING LICENCE AREAS IN 1991

ROE FISHERY INFORMATION

TABLE 1: 1991 AVERAGE CATCH FOR SEINE

TOTAL SEINE QUOTA (SHORT TONS) / NUMBER OF SEINE LICENCES = 17786 / 239 = 74.42 Tons

DOES NOT INCLUDE 13 CHARTERED SEINERS

TABLE 2: 1991 AVERAGE CATCH FOR GILLNETS

TOTAL GILLNET QUOTA (SHORT TONS) / NUMBER OF GILLNET LICENCES = 14553 / 1327 = 10.97 Tons

TABLE 3: IDEAL DISTRIBUTION OF LICENCES BASED ON AVERAGE CATCH FOR EACH AREA IN 1991

LICENCE AREA	SEINE QUOTA (TONS)	IDEAL NO. OF LIC.'S	GILLNET QUOTA (TONS)	IDEAL NO. OF LIC.'S
QUEEN CHARLOTTE IS.				
(2E)	3255	44	500	46
(2W)	1445	19	0	0
PR. RUPERT	1000	14	1902	173
CENTRAL	5378	72	1446	132
STRAIT OF GEORGIA	1000	13	1644	150
			7356	335*
W.C.V.I. (24-25)	1000	14	1705	156
(23)	4708	63		
Total	17786	239	14553	1327

(* Based on 2 for 1 licencing plan)

TABLE 4: ROE HERRING FIXED QUOTAS - (SHORT TONS) 1984 TO 1991

	1984	1985	1986	1987	1988	1989	1990	1991
QUEEN CHARLOTTE IS.	5070	5512	4150	1555	closed	1000	6102	5200
PRINCE RUPERT	4409	5512	7000	6000	8319	8092	3837	2902
CENTRAL	7275	4519	2516	3661	4127	8566	8218	6824
GULF	12786	5181	closed	8870	7100	8151	7800	10000
W.C.V.I.	4960	closed	closed	10363	8940	11360	7889	7413
ALL COAST	34501	20724	13666	30449	28486	37169	33846	32339

TABLE 5 - Distribution of Licenced Gear by Type and roe Herring Area, 1990

ROE HERRING AREA		SEINES	GILLNETS
Queen Charlotte Islands	(2E)	54	72
	(2W)	11	–
Prince Rupert		16	186
Central Coast		59	201
Strait of Georgia		0	746[2]
West Coast Vancouver Is.		99	122
	Total	239[1]	1327

[1] Seine total does not include 13 chartered seiners.
[2] Two for one licencing.

TABLE 6 - Roe Herring Quotas (Tons) by Roe Herring Area, 1990

ROE HERRING AREA		SEINES	GILLNETS	TOTAL
Queen Charlotte Islands	(2E)	4000	1000	5000
	(2W)	1102	2137	1102
Prince Rupert		1700	2918	3837
Central Coast		5300	2918	8218
Strait of Georgia		0	7800	7800
West Coast Vancouver Is.		6513	1376	7889
Total		18615	15231	33846
Target Catch Division		55%	45%	

TABLE 7 - Hailed Catches (Tons) by Gear and Roe Herring Area, 1990

ROE HERRING AREA		SEINES	GILLNETS	TOTAL
Queen Charlotte Islands	(2E)	5800	1247	7047
	(2W)	1745	0	1745
Prince Rupert		1706	2500	4206
Central Coast		5139	3142	8281
Strait of Georgia		0	8255	8255
West Coast Vancouver Is.		7294	2195	9489
Total		21684	17339	39023
Achieved Catch Division		56%	44%	

TABLE 8 Landed Weight and Value of British Columbia Roe herring catches 1980 - 1990
(Sales Slip Data - does not include Roe Herring Charter payment or seized fish)

Year	Landed Weight (tons)	Landed Value * ($ millions)
1980	19,330	23.91
1981	32,087	32.62
1982	29,593	31.58
1983	39,058	46.45
1984	33,379	39.14
1985	25,691	36.35
1986	15,681	39.24
1987	38,790	91.33
1988	30,786	81.00
1989	42,016	64.07
1990	39,709	N/A

* Estimated value based on average price paid for seine and gillnet fish.

** Preliminary estimates.

TABLE 9 - Sales Slip Data (tons) by Roe Herring Area, 1990

ROE HERRING AREA		SEINES	GILLNETS	TOTAL
Queen Charlotte Islands	(2E)	5787	1290	7077
	(2W)	2168	–	2168
Prince Rupert		2224	2588	4812
Central Coast		5335	3357	8693
Strait of Georgia		0	8690	8690
West Coast Vancouver Is.		7819	2132	9951
	Total	23333	18057	41391

TABLE 10 - Hailed Roe Herring Catch (Tons) Area 1 (Queen Charlotte Islands) by Statistical Area and Gear Type, 1984 - 1990

YEAR	GEAR	2E	2W	SUB TOTAL	TOTAL
1984	SN	5100	----	5100	5691
	GN	591	----	591	
1985	SN	4825	----	4825	6383
	GN	1558	----	1558	
1986	SN	3143	----	3143	4067
	GN	924	----	924	
1987	SN	2061	----	2061	2061
	GN	----	----	0	
1988	SN	NO FISHERY		0	0
	GN				
1989	GN	----	1245	1245	1245
	GN	----	----	0	
1990	SN	5800	1745	7545	8792
	GN	1247	----	1247	

TABLE 11 - Hailed Roe Herring Catch (Tons) Prince Rupert by Statistical Area and Gear Type, 1984 - 1990

		Hailed Catch (Tons) by Statistical Area				
Year	Gear	3	4	5	Sub Total	TOTAL
1984	SN	---	---	1835	1835	4043
	GN	---	2208	---	2208	
1985	SN	---	---	3007	3007	6820
	GN	---	3813	---	3813	
1986	SN	---	---	3606	3606	8606
	GN	---	5000	---	5000	
1987	SN	---	---	2118	2118	6587
	GN	(----------4469----------)		---	4469	
1988	SN	---	---	3800	3800	8829
	GN	(----------5029----------)		5029		
1989	SN	---	---	3541	3541	8813
	GN	(----------5272----------)		5272		
1990	SN	---	---	1706	1706	4206
	GN	---	2500	---	2500	

TABLE 12 - Hailed Roe Herring Catch (Tons) Central Coast by Statistical Area and Gear Type, 1984 - 1990

		Hailed Catch (Tons) by Statistical Area				
Year	Gear	6	7	8	Total	TOTAL
1984	SN	(-------3910-------)		---	3910	7758
	GN	(-------3848-------)		---	3848	
1985	SN	---	3045	---	3045	5307
	GN	---	2262	---	2262	
1986	SN	2112	---	---	2112	3207
	GN	(----------1095----------)			1095	
1987	SN	-----	2673	---	2673	3652
	GN	-----	979	---	979	
1988	SN	(----------3585----------)			3583	4519
	GN	(---------936--------)		---	936	
1989	SN	----	6257	---	6257	8953
	GN	(--------2696--------)		---	2696	
1990	SN	----	5139	---	5139	8281
	GN	(--------3142--------)		---	3142	

TABLE 13 - Hailed Roe Herring Catch (Tons) Strait of Georgia by Statistical Area and Gear Type, 1984 - 1990

		Hailed Catch (Tons) by Statistical Area				
Year	Gear	14	15	17	Sub Total	TOTAL
1984	SN	—	4438	—	4438	12763
	GN	8325	—	—	8325	
1985	SN	2879	—	—	2879	6565
	GN	3686	—	—	3686	
1986	SN	—	—	—	0	0
	GN	—	—	—	0	
1987	SN	—	3432	—	3432	10072
	GN	2417	—	4223	6640	
1988	SN	1715	—	—	1715	8685
	GN	6970	—	—	6970	
1989	SN	732	—	984	1716	8120
	GN	6406	—	—	6404	
1990	SN	—	—	—	0	8255
	GN	4755	—	3500	8255	

TABLE 14 - Hailed Roe Herring Catch (Tons) West Coast of Vancouver Island by Statistical Area and Gear Type, 1984 - 1990

		Hailed Catch (Tons) by Statistical Area					
Year	Gear	23	24	25	27	Sub Total	TOTAL
1984	SN	6000	—	—	—	6000	7226
	GN	—	—	1026	—	1226	
1985	SN	—	—	—	—	—	—
	GN	—	—	—	—	—	
1986	SN	—	—	—	—	—	—
	GN	—	—	—	—	—	
1987	SN	15143	—	—	—	15143	17953
	GN	—	—	2810	—	2810	
1988	SN	5700	2690	—	—	8390	9890
	GN	—	1500	—	—	1500	
1989	SN	10091	—	—	—	10091	13783
	GN	3692	—	—	—	3692	
1990	SN	7294	—	—	—	7294	9489
	GN	—	2195	—	—	2195	

TABLE 15 - Dates and Locations of Roe Herring Fisheries in the North Coast 1980-1990

Queen Charlotte Islands (Areas 1, 2E, 2W)

	Fishing Dates and Locations			
Year	SEINE		GILLNET	
1980	March 23 March 19-21	Skincuttle Inlet Louscoone Inlet	Feb. 12-14, 17-20 March 19-21 March 24-27	Naden Harbour Louscoone Inlet Skincuttle Inlet
1981	March 17 March 21 March 24 March 25	Skincuttle Inlet Inskip Inlet Atli Inlet Rennel Sound	March 18-20 March 24-30	Skincuttle Inlet Atli Inlet
1982	March 14 March 20 March 22 March 22	Lower Juan Perez Sd Inskip Channel Atli Inlet Atli Inlet	March 20-20	Inner Skincuttle Inlet
1983	March 09 March 21	Lower Juan Perez Sd Inskip Channel	March 15	Outside Poole Inlet
1984	March 2	Lower Juan Perez Sd	March 14	Poole Inlet
1985	March 11	Skincuttle Inlet	March 25-26	Inner Skincuttle Inlet
1986	March 23	Skincuttle Inlet	April 7	Juan Perez Snd
1987	March 20	Juan Perez Sound	No fishery	
1988	No fishery		No fishery	
1989	March 28	Louscoone Inlet	No fishery	
1990	March 26	Louscoone Inlet	April 8	Burnaby Straits

TABLE 15. cont'd.

Prince Rupert (Areas 3, 4, 5)

Fishing Dates and Locations

Year	SEINE		GILLNET	
1980	March 29-31	Kitkatla Inlet	March 29-31	Kitkatla Inlet
1981	March 27	Kitkatla Inlet	April 3	Kitkatla Inlet
1982	No fishery		No fishery	
1983	No fishery		No fishery	
1984	March 21	Kitkatla Inlet	March 26	Big Bay
1985	March 28	Kitkatla Inlet	March 26-28	Big Bay
1986	April 2	Kitkatla Inlet	April 12-13	Big Bay
1987	March 31 April 1	Kitkatla Inlet	March 24-25,29 April 2	Big Bay North Porcher Island
1988	April 4	Kitkatla Inlet	April 2, 3, 4, 6	Big Bay
1989	April 2, 3	Kitkatla Inlet	April 2, 3, 4	Big Bay
1990	April 3, 4	Kitkatla Inlet	March 28	Big Bay

Central Coast (Areas 6, 7, 8, 9, 10)

Fishing Dates and Locations

Year	SEINE		GILLNET	
1980	No fishery		Mar 18-19 25-26 March 25-26	Weeteeam Bay Kitasu Bay
1981	No fishery		March 14-16 March 17-18 March 18-20 March 22-23	Powell Anchorage-Reid Pass Weeteeam Bay Kitasu Bay Cape Mark
1982	March 15	Stryker Bay	March 18-19 March 21-22	Cape Mark-Thompson Bay Kitasu Bay-Higgins Pass
1983	March 15	East Houghton Islands	March 21 March 23	W. Coast Price Island Houghton Islands, Thompson Bay, Stryker Bay, Cecilia Island
1984	March 16-17	East Higgins Pass	March 27-29	Kitasu Bay, Powell Anchorage S.E. Princess Alice Island
1985	March 11	Spiller Channel	March 31-April 1	Weeteeam Bay, Kitasu Bay, Powell Anchorage, Spiller Channel, Dundivan Inlet, Thompson Bay, Waskesiu Pass, Houghton Islands, Kwakshua Channel
1986	March 29	E. Higgins Pass	April 5	Kitasu Bay, Powell Anchorage, Spiller Channel, Lower Thompson Bay
1987	March 25	Seaforth Channel Spiller Channel	March 30	Powell Anchorage, Stryker Bay Kitasu Bay
1988	March 19	Stryker Bay Thompson Bay	March 28-30	Kitasu Bay, Thompson Bay, Raymond Pass
1989	March 24 March 25	Kitasu Bay E. Higgins Pass	March 30, 31 April 1, 3, 4	E. Higgins Pass Kitasu, Thompson & Stryker Bays, Boddy/Joassa Channel Norman Morrison Bay
1990	March 19 March 24	Spiller Channel Spiller Channel	March 28 March 29	Kitasu Bay & Stryker Bay Kitasu Bay Stryker Bay Thompson Bay

TABLE 16 - Dates and Locations of Roe Herring Fisheries in the South Coast 1980-1990

Strait of Georgia (Areas 12-19)

	Fishing Dates and Locations			
Year	SEINE		GILLNET	
1980	Area 14 March 16	Lambert Channel	Area 14 March 5-6	Lambert Channel
			Area 17 March 9-12	North West Bay
1981	Area 14 March 7-8	Hornby - Denman Island	Area 14 March 5-7	Hornby - Denman Island
1982	Area 17 March 7-8	Pylades Channel	Area 14 March 5-7	Hornby - Denman Island
1983	Area 14 Feb. 27	Cape Lazo	Area 14 Feb. 27-Mar. 1	Hornby - Denman Island
	Area 15 March 4-5	Powell River		
	Area 17 March 2	Nanoose Bay		
1984	Area 15 March 2,4	Powell River	Area 14 March 9-11	Cape Lazo, Nanoose Bay
1985	Area 14 March 6	Hornby - Denman Island	Area 14 March 8-9	Hornby - Denman Island
1986	No fishery		No fishery	
1987	Area 15 March 14-15	Powell River	Area 14 March 9, 17	Hornby - Denman Island
	Area 14 March 6, 7	Baynes Sound	Area 17 March 17, 18	Yellow Point
			Area 14 March 7, 9	Lambert Channel
1988	Area 14 March 3	Baynes Sound	Area 14 March 12	Hornby Island/Denman Island
1989	March 11, 12	Pylades & Stuart Channel	March 15	Cape Lazo/French Creek
1990	No fishery		March 14	Cape Lazo Hornby/Denman
			March 22-24	Hornby/Denman French Creek Stuart Channel

TABLE 16. cont'd.

W.C.V.I. (Areas 23-27)

Fishing Dates and Locations

Year	SEINE		GILLNET	
1980	Area 24 March 7-8	Clayoquot Sound	Area 24 March 8	Clayoquot Sound
			Area 25 March 2-5	Esperanza/Nuchatlitz Pt. Langford
			Area 27 March 3-9	Winter Harbour
1981	Area 23 March 11	Barkley Sound	Area 23 March 15-16	Barkley Sound
	Area 25 March 8, 10	Nootka Sound	Area 24 March 15-16	Clayoquot Sound
			Area 25 March 8-1 0	Esperanza/Nuchatlitz, Pt. Langford
			Area 27 March 6-13	Winter Harbour
1982	Area 23 March 17, 18	Barkley Sound	Area 24 March 8-9	Clayoquot Sound
	Area 24 March 8	Clayoquot Sound	Area 25 March 7-12	Esperanza/Nuchatlitz, Pt. Langford
	Area 27 March 7, 8	Winter Harbour	Area 27 March 8-14	Winter Harbour
1983	Area 23 March 1	Barkley Sound	Area 25 March 3	Esperanza, Nuchatlitz
			Area 27 Feb. 28-Mar. 4	Winter Harbour
1984	Area 23 March 8	Barkley Sound	Area 25 March 5	Esperanza/Nutchatlitz
			Area 27 March 3-6	Winter Harbour
1985	No fishery		No fishery	
1986	No fishery		No fishery	

TABLE 16. cont'd.

W.C.V.I. (Areas 23-27)

Fishing Dates and Locations

Year	SEINE		GILLNET	
1987	Area 23 March 12	Barkley Sound	Area 25 March 12	Esperanza/Port Langford Nuchatlitz
1988	Area 23 March 11	Barkley Sound		
	Area 24 March 11	Clayoquot Sound Cypress Bay		
1989	Area 23 March 13, 17	Barkley Sound	Area 23 March 23	Hand/Pinkerton/Turtle Island
1990	March 11, 12	Barkley Sound	March 21	Yellow/Elbow Banks

TABLE 17 - SPAWN AREA INDEX (LENGTH *WIDTH * PERCENT COVER * LAYERS) FOR THE NORTHERN COASTAL WATERS OF BRITISH COLUMBIA FROM 1984 TO 1989 BY HERRING SUB-DISTRICT AND STATISTICAL AREA.

	SPAWNING YEARS							
AREA	1985	1986	1987	1988	1989	1990	Average	Years
Queen Charlotte Island								
1	674.1	NS	NS	NS	NS	NS	134.8	1985-88
2E	2639.1	945.6	1455.6	3075.8 *	3529.6 *	5725.8 *	3302.7	1988-89
2W	305.5	158.7	166.5	511.4	2286.3 *	3010.3	685.7	1985-89
Total	3618.7	1104.3	1622.1	3587.2	5815.9	8736.1	4123.2	
Northern								
3	67.5	17.4	554.1	688.3 *	514.1 *	177.2	601.2	1988-89
4	7662.5	6246.7	7140.1	6046.5 *	1959.8 *	5095.8 *	4003.2	1988-89
5	2161.5	1252.8	2015.5	875.7 *	1655.6 *	543.1 *	1265.6	1988-89
Total	9891.5	7516.9	9709.7	7610.5	4129.5	5816.1	5870.0	
Upper Central								
6	1054.2	1604.7	1599.8	974.8	1690.6 *	1513.3 *	1308.4	1984-88
Total	1054.2	1604.7	1599.8	974.8	1690.6	1513.3	1308.4	
Lower Central								
7	736.9	1372.7	1431.6	6154.1 *	2397.4 *	4839.2 *	4275.8	1988-89
8	307.5	196.4	442.3	830.2	306.2	253.7	416.5	1984-88
9	24.8	87.2	209.0	95.6	64.6	302.6	96.2	1984-88
10	97.2	350.7	41.4	31.7	93.7	7.5	122.9	1984-88
Total	1166.4	2007.0	2124.3	7111.6	2861.9	5403.0	4911.5	
TOTAL N. COAST	15730.8	122232.9	15055.9	19284.1	14497.9	14498	21468	1984-88

* Spawn area index based on combined dive and surface survey information. NOTE: Due to the different methods used in measuring spawns by dive and surface surveys, valid comparisons between the S.A.I. calculated from each type of survey CANNOT be made. In areas where there is a history of dive survey information, averages for those years have been calculated (asterisk * years), and comparisons can be made between those years. Additionally, in areas where only surface surveys have been carried out averages have also been calculated for comparison.

TABLE 18 - SPAWN AREA INDEX (LENGTH * WIDTH * PERCENT COVER * LAYERS) FOR THE SOUTHERN COASTAL WATERS OF BRITISH COLUMBIA FROM 1984 TO 1989 BY HERRING SUB-DISTRICT AND STATISTICAL AREA.

	SPAWNING YEARS							
AREA	1985	1986	1987	1988	1989	1990	Average	Years
Upper East Coast								
11	0.0	16.3	4.9	0.5	0.2	NS	4.4	1984-88
12	251.2	264.2	262.5	828.4	372.5	447.0	395.8	1984-88
Total	251.2	280.5	267.4	828.9	372.7	447.0	400.1	
Middle East Coast								
13	0.1	7.7	61.1	0.0	0.0	26.5	13.8	1984-88
14	3090.8 *	8977.7 *	5861.1 *	5504.2 *	16041.5 *	14054.9	7895.1	1985-88
15	551.0	917.6	212.8	860.6	310.3	32.5	570.5	1984-88
16	0.0	0.0	1.9	0.0	0.0	0.0	0.4	1984-88
Total	3641.9	9903.0	6136.9	6364.8	16351.8	14113.9	8479.7	
Lower East Coast								
17	447.1	1373.9	1836.3 *	1709.0 *	888.2 *	3993.6 *	1477.8	1987-88
18	0.0	47.6	0.0	0.0	11.1	NS	11.7	1984-88
19	0.0	0.0	0.0	0.0	132.0	NS	26.4	1984-88
Total	447.1	1421.5	1836.3	1709.0	1031.3	3993.6	1516.0	
Lower West Coast								
23	3066.4 *	4710.1 *	2487.7 *	4098.9 *	6092.2 *	4795.7 *	4091.1	1985-88
24	1746.2	567.0	2561.2 *	4407.1 *	5047.2 *	3738.9 *	4005.2	1987-88
Total	4812.6	5277.1	5048.9	8506.0	11139.5	8534.6	8096.2	
Upper West Coast								
25	436.6	1210.8	1549.1	1510.4	1302.6	2116.4 *	1201.9	
27	1049.0	293.5	890.7 *	1197.4	1500.3 *	1994.5 *	1195.5	1987
Total	1485.6	1504.3	2439.8	2707.8	2802.9	4110.8	2397.4	
Southern Mainland								
29	0.0	0.0	0.0	17.1	8.0	NS	5.0	1984-88
Total	0.0	0.0	0.0	17.1	8.0	0.0	5.0	
TOTAL SOUTH COAST	10638.4	18386.4	15729.3	20133.6	31706.1	31200		1984-88
TOTAL COAST	25174.5	26369.2	30619.3	39417.8	46192.9	52668		

* Spawn area index based on combined dive and surface survey information. NOTE: Due to the different methods used in measuring spawns by dive and surface surveys, valid comparisons between the S.A.I. calculated from each type of survey CANNOT be made. In areas where there is a history of dive survey information, averages for those years have been calculated (Asterisk * years), and comparisons can be made between those years. Additionally, in areas where only surface surveys have been carried out averages have also been calculated for comparison.

Fisheries
and Oceans

Fisheries - Pacific Region
Suite 400 - 555 West Hastings St.
Vancouver, B.C.
V6B 5G3

Pêches - Région du Pacifique
Pièce 400 - 555 rue Hastings ouest
Vancouver (C.-B.)
V6B 5G3

Your file Votre référence

Our file Notre référence

Department of Fisheries & Oceans
Small Craft Division
JAN 25 1990
File No. .....
NANAIMO, B.C.

JAN 22 1990

Dear Spawn-on-Kelp Licence Holder:

The enclosed copy of the 1990 Herring Spawn-On-Kelp plan will describe in detail the way in which the fishery will be conducted.

The plan was developed utilizing the herring management consultative process with consideration given to the appropriate allocation of the resource to each of the user groups. In 1990 2,600 short tons of herring or about 6% of the total coastwide catchable surplus was allocated to the spawn-on-kelp fishery.

In 1990 light pink coloured square pails will be used for all processed product as a condition of licence. Additionally, sequentially numbered decals for each bucket will be issued by the Department that will have to be applied at the time of processing. The pails, of course, will be available at your usual supplier.

As agreed to at our November 1, 1989 meeting between licence holders and the Department of Fisheries and Oceans your completed sales slips shall be submitted by September 15 after each season. The Department of Fisheries and Oceans agreed to acknowledge in writing the receipt of your completed sales slips.

Have a safe and prosperous 1990 fishery.

Yours truly,

A.F. Lill, P. Eng.
Regional Director
Fisheries Branch

Encl:

Canada

MANAGEMENT PLAN FOR THE 1990 HERRING SPAWN-ON-KELP FISHERY

Each year the Spawn-on-Kelp Licence Holder's Committee meets with DFO representatives to discuss management concerns. In 1984, spawn-on-kelp fishery representatives were appointed to the Herring Industry Advisory Board, so that concerns of licence holders could be brought to the attention of both Industry and Fishery Managers.

Since 1979 there have been 28 spawn-on-kelp licences (J licence category) issued annually. The licence is not transferable, is issued to a person or Native Band and authorizes the holder to harvest a certain quantity of spawn-on-kelp; since 1980 each licence authorizes harvest of 8 short tons, except 1986 when a 6 ton quota was implemented due to an overall low herring stock size.

In 1990, a total of 2,600 tons of herring, have been allocated to the spawn-on-kelp fishery. The distribution of licences and herring allocation for each area is represented in Table 1.

TABLE 1

Area	Number of Licences	Herring Allocations (Tons)
Queen Charlotte Islands (Statistical Areas 1-2)	11	1100
Prince Rupert (Statistical Areas 3-5)	8	800
Central Coast (Statistical Areas 6-10)	5	300 (200)[a]
Strait of Georgia (Statistical Areas 11-18, 28)	0	0
West Coast Vancouver Island (Statistical Areas 19-27)	4	400
TOTAL	28	2600

NOTES: [a] From minor stocks.

Allocations are made for each Area by estimating the quantity of herring that will be used in the spawn-on-kelp fishery. For each closed impoundment 100 tons are allocated and for open ponds 35 tons are allocated.

Production in excess of each fishermens' quota will be released to the crown by the licence holder using the attached "Relinquishment of Claim" form (Attachment 1) and will be sold later by Crown Assets. The grade of product released is to be in the same proportion as the grade mix in the total production of the licence holder. Details are specified in licence conditions (Attachment 2). As in 1988 and 1989 spawn-on-kelp landings will be measured by dockside drained weight. Details are specified in the attached conditions of the category "J" licence.

2. LICENCING REQUIREMENTS

Persons who were issued a category 'J' licence in 1989 may apply for a 1990 'J' licence. Issuance of a licence is based upon compliance with the Conditions of the previous year's licence and Licence Division requirements. These conditions include the return of a Sales and Catch Slip Report to the Herring Coordinator by September 15, 1990. The licence holder shall complete and submit the licence application specifying the desired area of operations, persons employed and vessels used in the operation. Any registered commercial fishing vessel may be used in the fishing operation; except category 'D' vessels may engage in transport only. All vessels used must have a valid commercial fishing licence and approved Fish Hold Inspection. The licence fees remain the same at $10.00 for Native Indians and $2,000.00 for other licence holders.

Marking of spawn-on-kelp ponds with the licence numbers, and removal of buoys, lines or other material used for fishing are required as part of the regulations. Licence holders are requested to remove pond frames from the water prior to June 30.

Once an application has been processed, the spawn-on-kelp licence with attached Conditions of the licence (Attachment 2) is sent to the Fishery Officer in the appropriate district and must be picked up by the applicant.

MANAGEMENT OBJECTIVES

1. CONSERVATION AND PROTECTION

All herring allocated to the herring spawn-on-kelp fishery are accounted for in the overall Pacific Herring Management Allocation Plan. Allocations to all herring fisheries are made so that the sum total of all fishery quotas for each area does not exceed the overall fishing quota for that area. The sum of the catch quotas in each

area approximates 20% of the estimated stock as forecasted by the Pacific Stock Assessment Review Committee.

2. INTENDED USE OF PRODUCT/CATCH

The naturally spawned herring eggs on macrocystis kelp is marketed mainly in Japan for the restaurant trade. In some cases herring from the ponds are sold for halibut bait after the spawning process is complete. Fishermen that employ the open pond method do not have opportunity to sell the spawned out herring for bait since no herring are caught or enclosed.

3. ECONOMIC VIABILITY

This fishery usually utilized about 5-6% of the total annual coastwide allocation. The economic benefits to fishermen have been high with annual landed values that steadily grew from $2.2 million in 1980 to a record high of $12.4 million in 1988. The landed value in 1989 was $8.5 million. The herring spawn-on-kelp fishery is a relatively small fishery that provides income to the industry from March through to May each season when much of the fishing fleet is idle.

4. PUBLIC HEALTH

To ensure product quality, all herring spawn-on-kelp harvesters and companies processing spawn-on-kelp must adhere to the following requirements:

(a) All herring spawn-on-kelp must be shipped to, graded, packed, labelled and exported from establishments possessing valid Federal Certificates of Registration as fish processing plants.

(b) Containers must be used to collect and hold spawn-on-kelp during harvesting and for transporting to the processing plants. These should be constructed of approved materials; that is, fibreglass, plastic or aluminum. They must also be fitted with rigid covers when holding product outdoors, to protect the product from weather and contamination. Any alternative proposal must be cleared by the local Inspection Officer.

(c) During the holding and transporting period the product should be kept chilled to prevent quality loss.

(d) All boats used for transporting herring spawn-on-kelp must have valid commercial fishing vessel licences and have passed boat inspection.

(e) For export of the product from registered processing plants, square plastic pails with tight fitting lids are the most acceptable. These cause minimal damage to the product. In 1990 these pails must be of a Light pink colour as specified by the Department of Fisheries and Oceans. Lids and spacers can remain the normal white colour.

(f) Export containers must be properly labelled to show the name of the product, the weight and the processor or distributor. The containers must also indicate the date on which the product was packed so that if there are any problems the product can be segregated into lots without having to hold or delay the entire shipment. The licence number of the permit holder and a sticker numbered sequentially, as issued by the Department must also appear on the container.

(g) Product certification is a requirement of the Pacific Herring Fishery Regulations and all shipments must be accompanied by an export certificate issued by an Inspection Officer before the goods leave the registered plant.

When the lot is ready for inspection, application in writing must be made to any of the following:

Mr. Wayne Holmes
Fish Inspection Laboratory
Department of Fisheries and Oceans
4250 Commerce Circle
Victoria, B.C.
V8Z 4M2

Mr. Dale Paterson
Fish Inspection Laboratory
Department of Fisheries and Oceans
2250 South Boundary Road
Burnaby, B.C.
V5M 4L9

Mr. Merv Thorne
Fish Inspection Laboratory
Department of Fisheries and Oceans
Room 224 - 417 Second Avenue W.
Prince Rupert, B.C.
V8J 1G8

To issue the export certificate, the Inspection Branch will require certain information to satisfy the Department of Fisheries and Oceans' authorities. Therefore, your application must include the following information:

(a) Product description including:
- lot number or day code
- number of buckets
- weight per bucket and total weight
- sequential numbers (from stickers issued by the department)
- permit number (if more than one permit number, the amount supplied by each).

(b) Consignee.

(c) Consignor.

(d) Identifying marks.

(e) Date of shipment.

(f) Method of shipment - specific vessel or flight must be stated.

N.B. The certificate will be valid for product shipped only on the date as stated on the certificate.

ATTACHMENT 1

DEPARTMENT OF FISHERIES AND OCEANS

FILE:

RELINQUISHMENT OF CLAIM

NAME: ADDRESS: PROVINCE: TELEPHONE:

BY THESE PRESENTS, ON MY BEHALF OR ON THE BEHALF OF MY HEIRS, EXECUTORS OR ADMINISTRATOR RELEASE FOREVER THE GOVERNMENT OF CANADA AND THE DEPARTMENT OF FISHERIES AND OCEANS FROM ALL MANNER OF ACTIONS, CLAIMS, SUITS OR DEMANDS IN ANY WAY AND DECLARE BEING FULLY SATISFIED WITH THE ACTION TAKEN AND THE SETTLEMENT OF THE FOLLOWING:

DESCRIPTION

Witness

Signature

CATEGORY J LICENCE NO.

CONDITIONS

1. The following Terms and Conditions apply to all 1990 category 'J' licences issued under the authority of the Fisheries Act and Pacific Fishery Regulations, 1984.

2. All persons engaged in spawn-on-kelp operations shall comply with all Acts and Regulations applicable to a spawn-on-kelp operation.

3. Notwithstanding the generality of the foregoing, the following operational procedures shall also be complied with:

   (a) The following items shall be determined in conjunction with and approved by a Fishery Officer responsible for the geographic area in which the operation is to be conducted, and shall be indicated on the form title **SCHEDULE A** (Attachment 3) and the fully completed form shall remain attached to the licence at all times. Schedule A shall be completed prior to commencing operations under this licence.

   - The commencement and termination date of the pending operation;
   - The dates on which herring are authorized to be taken for impoundment;
   - The construction, type, marking and number of enclosures;
   - The geographic area and location of fishing for herring and of the enclosures;
   - The date on which enclosures are to be dismantled.

4. All captured or impounded herring taken as part of the fishing operation authorized by this licence shall be released following harvest of the spawn-on-kelp, except where specific arrangements have been made with the District Fishery Officer.

5. The maximum quantity of herring spawn-on-kelp authorized to be taken by this licence shall not exceed 8 (eight) short tons (7.26 tonnes) harvested product weight.

6. Where an unavoidable excess of production may occur, such overage may not be retained by the licence holder or any other person and shall be delivered, together with a fully completed Relinquishment of Claim Form, to an officer of the Department of Fisheries and Oceans for disposition as he may deem appropriate. Said Form is provided by the Department of Fisheries and Oceans and is attached herewith. (See Attachment 1).

7. Marine plants permitted for use as substrate are limited to the species Macrocystis, inergrifolia or Laminaria saccharina.

8. Prior to weighing spawn-on-kelp product at a processing plant, the product may be drained for a period up to a maximum of 12 (twelve) hours. The spawn-on-kelp landing must be reported to the local fishery officer prior to draining.

9. After weighing as per item #8, an allowance of 5% of the total weight will be deducted to allow for a reasonable remaining weight of liquid and salt. Any excess weight above the quota authorized by this licence shall be delivered in accordance with item #6 on a prorated basis by product grade.

10. All salted product is considered as part of the total production under the quota, and shall not be returned to the sea nor separate from the quota production except with the express approval of a Fishery Officer.

11. Containers used to pack and transport herring roe-on-kelp shall be constructed of approved materials (ie. Fiberglass, Plastic, Aluminum). Wood construction is not permitted.

12. Processed spawn-on-kelp shall be packed in containers of a specific colour and a known weight. This weight shall be recorded and produced upon request by a Fishery Officer or Fish Inspection Officer. Each season in Jan. - Feb. the colour designation of the containers will be specified by the D.F.O. and all product must be packed in these containers. For the 1990 season the colours of the buckets will be light pink.

13. In accordance with the Pacific Fishery Regulations Section 24(2), each container of processed herring spawn-on-kelp shall be marked with the number of the category J licence under the authority of which it was collected. Marking of containers shall be done in a manner authorized by an Officer of the Department of Fisheries and Oceans.

14. Catch/sales slip forms (Attachment 4) provided by the Department of Fisheries and Oceans are to be fully completed and returned to Lloyd Webb, Regional Herring Coordinator no later than September 15, 1990.

ATTACHMENT 3

CATEGORY J LICENCE NO.

SCHEDULE A

THIS SCHEDULE TO BE FULLY COMPLETED BY A FISHERY OFFICER

1. Commencement date of ponding operation _____

2. Termination of ponding operation _____

3. Date on which herring is authorized to be taken for impoundment _____

4. Number of enclosures permitted _____

   Type of enclosures permitted _____

   Marking of enclosures required _____

   Enclosure construction requirements _____

5. Geographic area and location of fishing for herring _____

6. Geographic area and location of enclosures (ponding operation)

7. Enclosures to be dismantled by _____
   date

signature of Fishery Officer Office date

signature of Fishery Officer Office date

ATTACHMENT 3

1990 SALE AND CATCH REPORT
HERRING SPAWN-ON-KELP FISHERY

Name and Address Changes:

Name _____

Address _____

_____

_____

Tel. No. _____

1. Details of Impoundments/Ponds:

DFO Statistical Area	Location	Percentage Production From Open Ponds	Percentage Production From Impoundments
_____	_____	_____ %	_____ %
_____	_____	_____ %	_____ %

2. Did you operate in a Pool: Yes _____ / No _____
   If YES, list the names and licence numbers of other licence holders in your pool. _____

_____

_____

3. Spawn-on-kelp Quota: 16,000 pounds drained weight.

4. Total landed weight (including overage): _____ pounds drained weight.

5. Quota Production and Overage of Processed Spawn-on-kelp.

	Quota Production				Overage	
	Number of Pails	Total Weight(lbs)	Price per pound($)	Value($)	Number of Pails	Total Weight(lbs)
Grade 1	_____	_____	_____	_____	_____	_____
Grade 2	_____	_____	_____	_____	_____	_____
Grade 3	_____	_____	_____	_____	_____	_____
Grade 4	_____	_____	_____	_____	_____	_____
Grade 5	_____	_____	_____	_____	_____	_____
Grade 6	_____	_____	_____	_____	_____	_____
Grade 7	_____	_____	_____	_____	_____	_____
Grade 8	_____	_____	_____	_____	_____	_____
TOTAL:	_____	_____	_____	_____	_____	_____

6. Is this the final value of the product? Yes _____ No _____
   If NO, when do you expect a final price settlement? _____

7. Product Sold To: Company: _____
   Contact Name: _____
   Telephone No: _____
   Processor: (if different from Company above) _____

THIS FORM COMPLETED BY:

_____ _____ _____

(Name) (Signature) (Date)

RETURN THIS COMPLETED FORM BY SEPTEMBER 15, 1990 TO:

Lloyd Webb, Herring Co-ordinator
Department of Fisheries & Oceans
400 - 555 West Hastings Street
Vancouver, B.C.
V6C 5G3